THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXI. No. 768.] LONDON, JANUARY 29, 1878. [30TH YEAR.] Price 6d.

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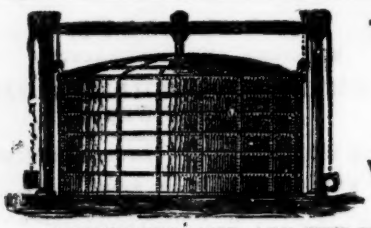

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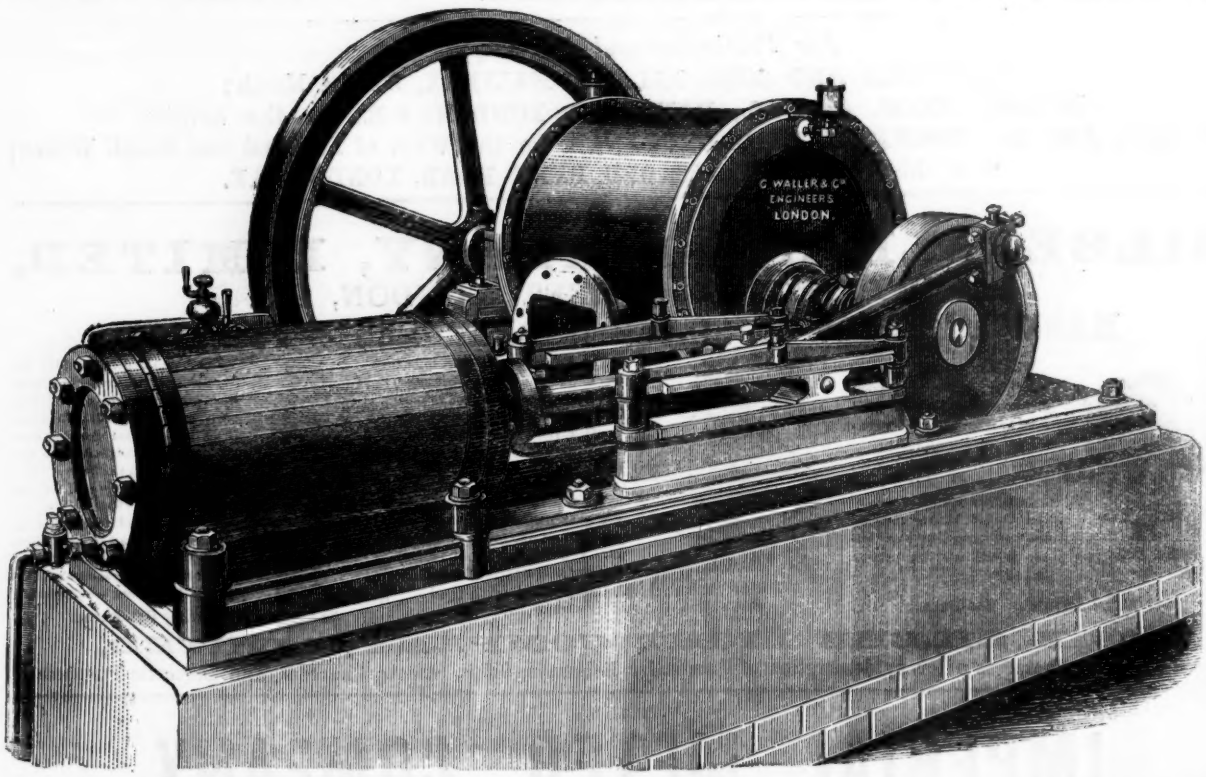

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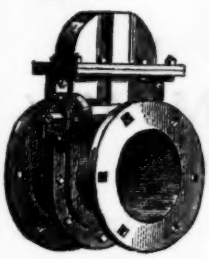

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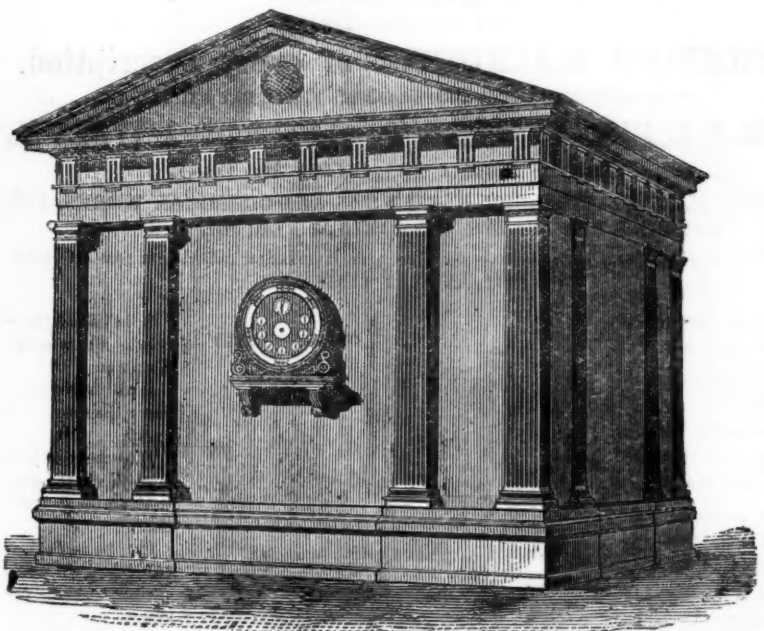

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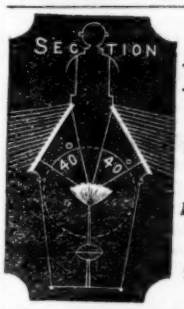

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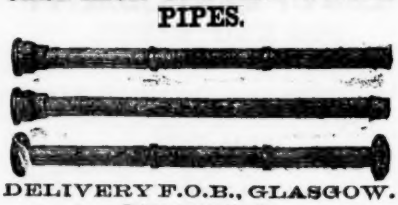
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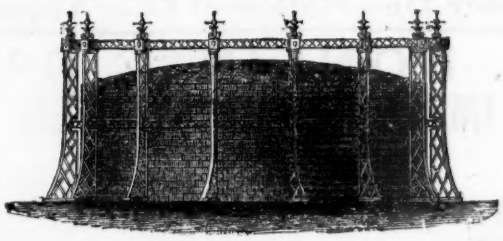
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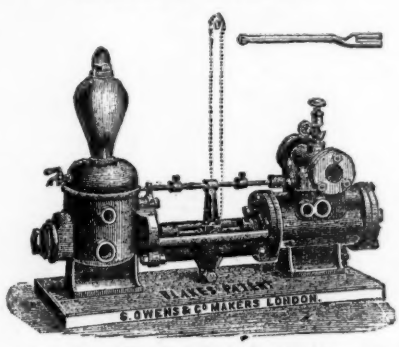
WHITEFRIARS STREET, LONDON, E.C.,
HYDRAULIC ENGINEERS,
AND MANUFACTURERS OF
PUMPING MACHINERY of every Description.
SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF
BLAKE'S PATENT STEAM-PUMPS,
More than 10,000 in use,
ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.
The following are some of the prominent advantages of the BLAKE PUMP:—

It will start at any point of stroke.
It has no dead point.
It works fast or slow, with the same certainty of action.
It is economical. Has a lead on the slide-valve.
It is compact and durable.



It is interchangeable in all its working parts.
It will deliver more water than any other pump.
It is made of best materials in the most workmanlike manner.
Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF
MANN & OWENS
IMPROVED PATENT GAS-VALVES.
PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

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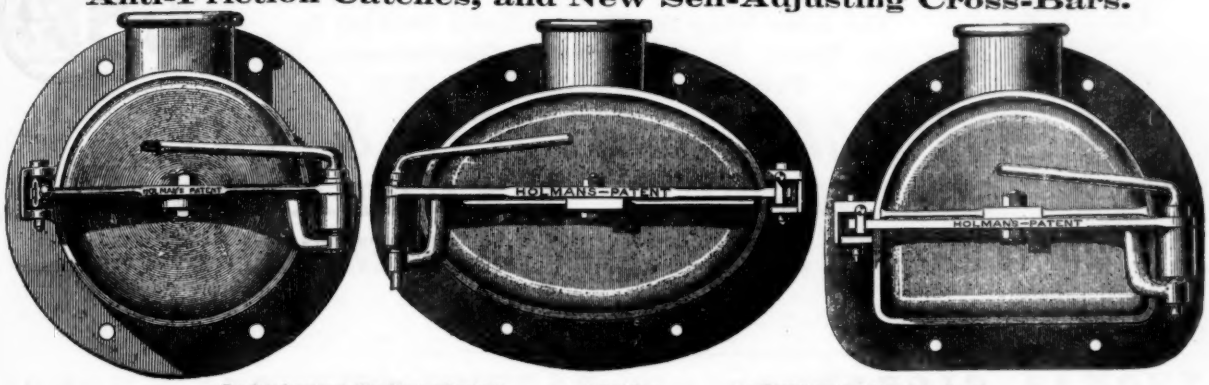
CORNWALL HOUSE, 35, VICTORIA ST., LONDON, E.C.

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland).

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

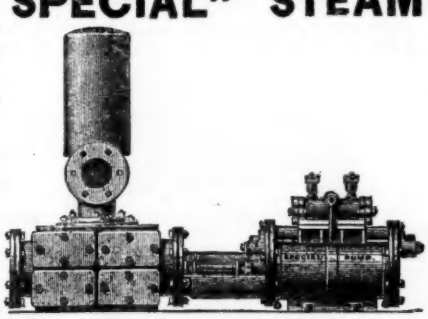
Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

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HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

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London, 1851 New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

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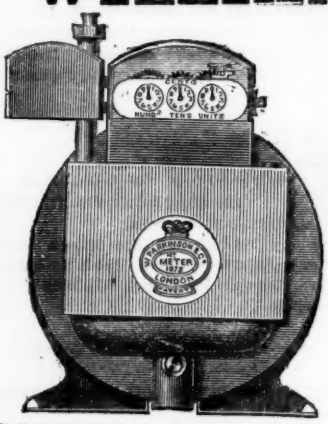
THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.,



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STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

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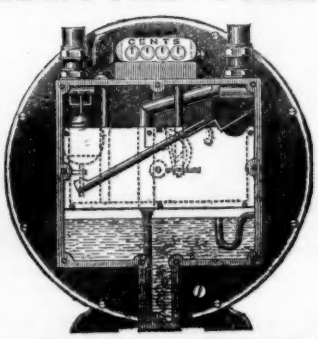
In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO SUBSCRIBERS.

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Subscribers who desire to avail themselves of the reduction in the subscription to the JOURNAL by paying in advance for the year 1878, are reminded that this can only be done during January.

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Vol. XXX. (second half of 1877) will shortly be ready, bound in cloth, gilt letters, price 18s. Cloth cases for binding may be obtained on order from any bookseller, or from the Publisher.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 29, 1878.

Circular to Gas Companies.

THE thirty-seven Gas Bills to be presented to Parliament in the present Session offer but few points of interest. No important contest is to be anticipated, inasmuch as the cases which will provoke disputes are of no great consequence. The Bills of the Bangor Corporation and of the Bangor Water and Gas Company will, as a matter of course, give rise to a fierce struggle in Committee; but it will be a mere storm in a teacup. Welshmen are, however, obstinate and litigious, and we anticipate that the matter will be fought out to the bitter end. The Corporation have little to gain by the purchase, and the Company have nothing to lose, if they can secure good terms on arbitration. We need not tell the Company the terms to which they may agree. Our columns record, as fully as we can obtain the information, all the sales effected. Twenty-five years purchase of statutory dividends, in the absence of proved *laches* on the part of the Company, is the acknowledged value of a statutory undertaking. Such a price the Bangor Company may accept, for it is the same as would probably be fixed on arbitration; and the expense and trouble of a reference may well be saved. The preamble of the Newry Compulsory Purchase Bill makes grave accusations against the Gas Company, which, if they be fully established, will probably lead to the triumph of the Town Commissioners. As yet, however, no case for the Company has been presented to us, and the defence they will offer may be conclusive in their favour. We hope it may be so, for it is with extreme regret that we see a Gas Company failing to do their duty to the public.

There are several competing Bills this Session, a number of Companies and Local Authorities being anxious to have, or to share, the honour of supplying larger or smaller districts in Yorkshire. We do not envy the Parliamentary Committees, who will have to decide between the conflicting claims of the several applicants for statutory authority. We are sorry that matters cannot be arranged between the Companies, so that a contest may be saved; but there are so many people interested in a parliamentary fight, that everything is done to stimulate and promote a struggle of that kind. Fancy the glorious holiday some of the Newry Commissioners, with their Clerk and Solicitor, will have in London presently. A fortnight at the Westminster Palace Hotel, or Morley's, at the expense of ratepayers, will greatly exhilarate their spirits, which may, however, be damped by the non-success of their Compulsory Purchase Bill. In any case, they will go back to Newry with their fingers to their noses, and laugh at the dupes of ratepayers, whose gas bills will be none the less, and whose houses will be none the more brilliantly illuminated, if the Commissioners succeed in their objectionable project.

Up to the present time there have been few failures upon Standing Orders in either House, and we may conclude that most of the Bills promoted will go forward. We have not, as yet, remarked any failure in a Gas Bill; but, hitherto, all that have been promoted have not passed the Examiners, and had a first reading.

The gas agitation still continues at Hastings, and floods of nonsense were emitted at a public meeting held there last week. Undoubtedly, gas is somewhat dear there; but there are circumstances which completely justify the price. If the Town Council should, by any accident, get possession of the undertaking, they would be compelled to maintain the same charge for many years, and probably find it necessary to increase it. The idea of starting a competing Company, which some gentleman in Hastings entertained, is perfectly absurd. Parliament never sanctions competing Companies. In like manner the Town Council will find it impossible to set up an undertaking in competition with the Gas Company. They may, no doubt, buy the Company, if they will pay a fair price to them; but we do not see that the town and ratepayers will be in the least benefited. The dream of making large profits for public improvements is utterly delusive. Manchester, it is true, makes large profits; but it is only because the price of gas is half as much again as it need be. The gas consumers of Manchester have been taxed for the greater part of the public improvements made in that City during the last thirty years, and if the Consumers of Hastings are desirous of contributing to public improvements, let them urge on the Council in making a compulsory purchase of the Company's undertaking; but let them understand that the supply of gas by a Local Board is only one form of indirect taxation.

The formal transfer of the Ramsgate Gas and Water Works to the Local Board was completed on the 23rd inst., when the seal of the Board was duly fixed to an agreement for the loan of £155,000 from the Bank of England. The consideration paid for the gas undertaking is £70,052 12s., and for the water £70,436 18s. 7d. The 23rd was a great day for the Rev. E. Gripper Banks, who, after the proceedings, went home with an ill-concealed sense of triumph. He may, however, remember the motto, "*Finis coronat opus.*" He has now to make the works pay, and satisfy the Ratepayers of Ramsgate that his calculations were correct, and his deductions safe. If the Local Board can only make the most seedy-looking of our southern watering-places, commonly misnamed "health resorts," a little brilliant of an evening, our next visit to the place will be more agreeable.

At Colchester an agitation is growing up—and we never remember when there was not a discontent at Colchester. Very disinterested people are now endeavouring to incite the Town Council to take over the gas undertaking, and work it for the improvement and ornamentation of the town. We doubt

whether anything could beautify Colchester, but it certainly may be improved.

The British workman—we speak of him, of course, as a class—is becoming everywhere a serious sort of embarrassment. He is exacting, he is improvident, and he is lazy. He has just given the Weymouth Gas Company a taste of his qualities. The stokers, earning twenty-four shillings a week, asked for a considerable advance, and, it not being convenient to pay it, they gave notice, and at the end of a week left their work. In South Wales a large number of men are in idleness on account of their own folly, and their families are said to be in great distress. To Rhymney, then, the Weymouth Manager resorted for the labour he needed. Men came, went to work for two hours, then left their work, and demanded money to take them back again to Wales, which they did not get. They seem to have stayed in Weymouth some days, enjoying the beautiful scenery in the neighbourhood, supported, we presume, by the men on strike. There was, for a day or two, a fear that Weymouth would be left almost in darkness; but the energetic Manager soon collected a competent gang of stokers, and all risk was at an end. We sincerely hope the mania for striking will not spread among gas *employés*.

The merits of lighting by electricity, as compared with gas, have been discussed by the Members of the Institution of Civil Engineers. It must be admitted that, for lighting large areas, with few obstructions to the passage of light, electricity possesses many advantages. The light given is brilliant, and the cost low. But, as was very properly said at the Institution, when we come to lighting small separate apartments or shops, the advantage of gas is predominant, and will remain so until some means of minutely subdividing the current is discovered. We imagine that the day is distant when the announcement of such a discovery will be made. Impossibility is a word which cannot be employed in relation to any scientific object. If it could, we should be inclined to say that the minute subdivision of one electric current was an impossibility.

Dr. C. W. Siemens lectured on the same subject before the Society of Telegraphic Engineers. He is, perhaps, the most eminent practical electrician of the day, and his opinions have great weight. His machine and light are the most perfect at present in use, and we may look to him to take the lead in the development of the electric light. On the whole, Dr. Siemens agrees with the speaker quoted above, as to the difficulty of subdividing the current, and cheaply distributing the electricity to produce light. He says, "The complete realization of all the "advantages of the electric light remains, however, a problem to "be solved, and it would be extravagant to expect, from applica- "tions on a small scale such as have hitherto been made, anything "like the amount of relative advantage indicated by theory." In the meantime, the Money Market shows that a sagacious public maintain a firm belief in the stability of gas shares, which have now almost returned to what we may call their normal prices; and, everything going well, gas property will probably increase in value during the year.

Mr. Travers has once more, in a neat little pamphlet, called attention to the use of gas for heating and cooking purposes. He further suggests, in a letter which we publish elsewhere, the advisability of having an exhibition of useful apparatus for heating and cooking purposes at the coming meeting of the British Association of Gas Managers. We have a fear that Managers and Directors are not yet awake to the advantages they might derive from a large summer sale of gas, which can only be promoted by the extended use of gas for culinary purposes. If this could be effected, every bench of retorts might be at work all the year round, except so far as repairs and re-settings would be required. Stokers would be more satisfied; Managers, we think, would not be overworked; and Shareholders, we believe, would profit. London, we think, is not the place in which an exhibition is most needed. A stroller down the Strand has only to make use of his eyes. On the right-hand side of the way, from the Adelphi to where once stood Temple Bar, he will see several shops in which he will find displayed the best and most useful gas apparatus for heating and cooking purposes.

We publish to-day an ingenious plan, devised by Mr. W. C. Young, for the indirect determination of the amount of sulphur in coal gas. The process is as simple as it is ingenious; and we agree with Mr. Young in thinking that very accurate results may be obtained from its use in the hands of any one, not a skilled chemist, who will take a little pains.

Referring to some remarks in a recent "Circular," we observe that the Ipswich Gas Company deny that their gas is ever below the parliamentary standard; and, indeed, the returns of the Examiner himself show that the gas is, as a rule, very considerably above it. There seems some dispute as to the custody of the apparatus at the Town Hall. The Examiner and an Officer of the Gas Company should have equally free access to the room in which it is kept, and an Officer of the Company may always be present when the Examiner of the Town Council tests. The last return of the Examiner conclusively proves the Company to more than fulfil their duty to the public.

Water and Sanitary Notes.

THERE can be little doubt that the new scheme of water supply proposed by Messrs. Bazalgette, Bramwell, and Easton has no chance of success in the House of Commons. It is everywhere rejected in the Metropolis, and the best thing the Metropolitan Board could do would be to withdraw the Bill. At a meeting of Vestry Delegates (outside the Board), the new scheme was unanimously condemned by the speakers. The "Supply Bill," as it is called, has been sent to the several Vestries, and in a fortnight's time we shall get the opinion of the whole bodies, and not merely that of their delegates.

It is premature to speculate on the chances of the Purchase Bill. It must be admitted that this measure obtains a considerable amount of support. There is, however, even among our Local Authorities and among the general public, a strong suspicion that, however desirable it may be to abolish Water Companies, the Metropolitan Board, as at present constituted, is not the body to whom the water supply should be entrusted. Our wonder is that the Board should desire to be burdened with the management of these undertakings. The labour it would impose would be overwhelming. Nothing less would be required than the appointment of several small Committees to take the place of the Directors of the several Companies, and then a General Committee to govern the whole. Some people read, perhaps, in the papers, of the Water Committees of the Corporations of Manchester and Liverpool, and of the extensive works they manage, and of the grand schemes they indulge in, and they may imagine that the management of a water undertaking is a very simple matter. But the undertakings of Liverpool and Manchester shrink into insignificance when compared with those of the Metropolis; and the labour required for their management is as nothing compared with that which would be necessary to superintend the supply of upward of four millions of people. We are afraid the Board have not sufficiently considered the matter from this point of view. There are those, of course, who would undertake anything, and it has passed into a proverb that such men never do work well. We fear very much, then, that the management of the water supply by the Metropolitan Board would be a miserable failure, even if backed by the best professional assistance. With ignorant or dishonest advisers, there is no knowing what might happen.

The Water Purchase Bill of the Metropolitan Board of Works is naturally a very simple measure. It is to give the Board power to acquire the undertakings of the several Companies on giving notice within three years of the passing of the Act. It is to empower the Board to appoint a Committee for the management of the undertakings when they have been acquired, and to authorize the Board to borrow any amount of money to complete the purchase. A cash transaction is not, however, contemplated. It is proposed to create "Metropolitan Consolidated Water "Stock" equal to the amount of the purchase-money, which is to be paid off within one hundred years.

The Metropolis Water Supply Bill, which is to authorize the new scheme, is necessarily of a more complicated character. It seems that after all it is proposed to make the receipt of the new supply optional to existing owners.

A contemporary has made a suggestion that the Metropolitan Board of Works should now confine their Purchase Bill to an attempt to acquire the three Companies south of the river. If purchase can be justified, it might be well for the Board "to "try their 'prentice hands" on managing an undertaking on a comparatively limited scale; but the opportunity, we expect, will not be vouchsafed. The Water Companies must be transferred as a whole, or not at all. An idea appears to prevail that, because the Southwark and Vauxhall Company are just now under a cloud, they may be bought up at a low price. Twenty years purchase, at five per cent., is suggested; we may inform the enterprising speculators, however, that Parliament never allows the confiscation of a Company in temporary difficulties. The Southwark and Vauxhall Company will soon again be in a prosperous condition, and their water will, in respect of purity, be equal to any supplied from the Thames. Under these circumstances, a bargain is not to be expected.

The Corporation of Manchester have taken alarm at the motion of which Mr. E. Howard has given notice, and a deputation

from the Town Council have waited upon the President of the Local Government Board, and implored the assistance of the Government to prevent the motion from being carried. They also asked Government assistance in carrying the second reading of their Thirlmere Bill. Mr. Howard's motion has not exactly the aspect of hostility to the Manchester scheme, and we scarcely see how the scheme would be prejudiced if the motion were carried. The broad question which Mr. Howard wishes to raise before a Select Committee must some day be discussed.

GAS BILLS FOR 1878.

Ten Bills are promoted for the incorporation of Companies, some new, but for the most part those which have hitherto carried on their business as Limited Undertakings or under Deeds of Settlement.

The *Brading Harbour Gas Bill* is to incorporate a Company to supply such parts of the parishes of Brading and Saint Helen's, Isle of Wight, as are outside the limits of the Ryde Gas Act. The capital of the Company is to be £20,000, in £10 shares. Power is asked to borrow to the usual extent of one-fourth of the capital, the interest being limited to five per cent. It is proposed to supply gas of fourteen-candle power, at a price not exceeding 6s. per thousand. This being a new Company, they do not propose to adopt the sliding scale and auction clauses.

The *Castleford and Whitwood Gas Bill* is to dissolve and re-incorporate the Castleford and Whitwood Gas Company, Limited, with extended powers. The present capital of the Company is £30,000, of which £20,300 has been paid up. Power is sought to raise additional capital to the extent of £30,000, which sum is to include the premiums realized by the sale of shares by auction. The standard rate of dividend on the old and new capital is ten per cent., subject to the sliding scale. Borrowing power to the usual extent is asked. It is proposed to supply gas of fourteen-candle power, at an initial price of 4s. 7d.

The *East Grinstead Gas and Water Bill* is to dissolve and re-incorporate a Company who, under a deed of settlement, have carried on the business of a Gas Company since 1855. It is is proposed to convert the original share capital into stock, which to be called Capital A; the new issue of £5000, in £10 shares, to be called Capital B. There is a provision in the Bill for the ridiculous division of shares into preferred and deferred half shares. Borrowing powers to the usual extent are asked. Gas of fourteen-candle power is to be supplied, at a maximum price of 6s. per thousand feet within a radius of one mile, and 7s. beyond. The sliding scale is not proposed, but the dividends on the two classes of capital are limited as usual. The new shares are to be sold by auction or tender.

The *Hemel Hempsted District Gas Bill* is to dissolve and re-incorporate the Hemel Hempsted and Boxmoor Gas Company, and another Company supplying parts of the same district, and to amalgamate the two. The original capital of the conjoined undertakings is £17,500, nearly all of which is paid up. This Bill seeks power to raise additional capital to the amount of £20,000, with borrowing powers to the usual extent on both original and new capital. Subject to the sliding scale, the standard dividends on the old and new capital are to be respectively ten and seven per cent. Gas of fourteen-candle power is to be supplied, at the initial price of 5s. 5d., 6s., and 6s. 8d., according to the distance from the works. The new shares are, of course, to be offered by auction or tender, and the full amount of the nominal value of such share, together with the premium offered, must be paid within three months of the date of sale.

The *Lea Bridge District Gas Bill* is to dissolve and re-incorporate the Lea Bridge District Gas Company. The original capital of the Company is £50,000, of which £35,000 has been paid up; and the Company have borrowed on debenture bonds £7000. This Bill seeks power to raise additional capital to the extent of £65,000, which, with the £35,000 already paid up, will make the capital £100,000. Borrowing powers to the usual extent are sought. The standard dividend proposed is ten per cent., subject, of course, to the sliding scale. New shares are, equally as a matter of course, to be offered to the public by auction or tender. It is proposed to supply fourteen-candle gas, at the initial price of 5s. 6d. per thousand.

The *Lewes Gas Bill* is to dissolve and re-incorporate the Lewes Gas Company, formed in 1822, and hitherto carried on under a Deed of Settlement. The present capital of the Company is £26,880, fully paid up. By this Bill, power is sought to raise additional capital to the extent of £25,000. As the Company have no mortgage debt, power is sought to borrow on both old and new capital, and the dividend on the new capital is limited as usual. Gas of fourteen-candle power is to be supplied, at a maximum price of 6s. within the parliamentary boundaries, and 7s. beyond such limits. The sliding scale is not proposed, but the new shares are to be sold by auction or tender, as usual.

The *Lichfield Gas Bill* is to dissolve and re-incorporate the Lichfield Gas Company. The original capital of the Company was £10,000; but it is alleged in the preamble that money has been expended out of profits, which has raised the value of the undertaking to £19,000. The original capital and expended profits, it is proposed to convert into stock, and then to raise £6000, to be added to old capital, making together the original capital £25,000. The Bill further seeks authority to raise additional capital to the amount of £25,000. Borrowing powers to the usual extent are sought, both on the old and new capital. Subject to the sliding scale, the standard price of gas, which is to have an illuminating power of fourteen candles, is to be 5s. 6d. per thousand within a mile and a half of the Guildhall, and 6s. 6d. per thousand beyond that radius. The new shares are, of course, to be sold by auction or tender.

The *Marske and Saltburn Gas Bill* is to incorporate a new Company to take over the gas undertaking of the North-Eastern Railway, which has hitherto supplied a portion of the district; and also to unite with the Redcar and Coatham Gas Company, after which the combined Company shall be known as the Redcar, Coatham, Marske, and Saltburn Gas Company. The capital proposed is £40,000, carrying the usual borrowing powers. The consideration for the Marske works of the North-Eastern Railway is £8000, of which £1600 is already paid. The capital asked for by this Bill is in addition to that of the Redcar Company, and the Company promoting it will individually disappear. The Bill proposes to supply fourteen-candle gas, at a maximum price of 5s. per thousand cubic feet. It possesses some curious features, which, perhaps, may be explained when it comes before a Select Committee.

The *Normanton Gas Bill* is to dissolve and re-incorporate a Company, originally started to supply gas and water, but as they have never had a water undertaking, they, in this Bill, only ask for powers to supply gas. The original capital of the Company was £20,000, of which £18,000 has been paid up. Power is now sought to raise £45,000 additional capital, the dividends on which, subject to the sliding scale, are limited to the now usual rates. Borrowing power to the usual extent, on both old and new capital, is asked. The Bill proposes to supply fourteen-candle gas, at a standard price of 6s. per thousand cubic feet. The new capital is, of course, to be offered to the public by auction or tender.

The *Tredegar Water and Gas Bill* is to incorporate a Company, with power to work separately the water and gas undertakings of the Tredegar Iron and Coal Company, Limited. The capital at present engaged in these undertakings is £30,000. Power is sought to raise £30,000 additional capital, with the usual borrowing powers. The dividend on the new capital is limited to the usual extent, and gas having the illuminating power of fourteen candles is to be supplied, at a price not to exceed 6s. per thousand cubic feet. As this is virtually a new Company, auction clauses and the sliding scale are not introduced into the Bill.

The Gas-Works Clauses Act of 1871 is, of course, incorporated in all the above measures. Testing-places are to be established, and the standard burner in every case is to be Sugg's new "London," No. 1. In all cases, too, it is provided that interest shall be paid on money deposited by way of security.

Ten Bills are promoted to obtain further powers for Gas Companies already incorporated.

The *Bangor Water and Gas Bill* is to enable the Bangor Water and Gas Company to raise additional capital to the amount of £20,000, carrying the usual borrowing powers. The new shares are, of course, to be offered by auction or tender, and the full nominal value of the share, together with the premium, is to be paid within three months of the sale. The dividend on the new capital is limited to seven or six per cent., according as it is raised by ordinary or preference shares. Gas of fourteen-candle power is to be supplied, at, we presume, the price fixed by the Company's present Act.

The *Bournemouth Gas and Water Bill* is to confer extended powers on the Bournemouth Gas and Water Company. The present capital of the Company is £100,000, fully paid up, and they have borrowed £25,000. By this Bill, the Company seek power to raise additional capital to the amount of £150,000, and to borrow to the usual extent thereof. The new capital is, of course, to be offered by auction or tender, under the conditions fixed by Mr. Raikes' Standing Order. It is proposed to enact that the Company shall supply the public lamps by meter, if required by any Local Authority within their limits.

The *Cleveland Gas Bill* is to extend the limits of the Cleveland Gas Company, and enable them, if they can, to purchase the Gas-Works of the North-Eastern Company at Marske, and to supply that place and Saltburn-by-the-Sea. The present nominal capital of the Company is £50,000, of which only £23,000 has been raised, and the Company have no mortgage debt. Power is now sought to raise £30,000 additional capital, carrying the usual borrowing powers. The new capital is, of course, to be offered by auction.

The *Exeter Gas Bill* is to authorize the Exeter Gas Company to raise further capital. The present capital of the Company consists of £40,000 original, entitled to ten per cent.; £10,000 four per cent. preference stock; and £20,000 in five per cent. preference shares. By this Bill, the Company seek authority to raise a further sum of £130,000, carrying borrowing power to the usual extent. The new capital is to be offered by auction or tender, and the dividends on the new capital are limited as usual, subject to the sliding scale. The standard price of gas it is proposed to fix at four shillings per thousand, and the quality is to be fourteen candles, tested by Sugg's new "London," No. 1, burner.

The *Farnworth and Kearsley Gas Bill* is to enable the Farnworth and Kearsley Gas Company to raise further capital. The present capital of the Company is £61,000, all of which has been expended; and since they have converted the borrowed money into share capital, they have now no mortgage debt. This Bill is to authorize the Company to raise an additional sum of £100,000, by the issue of new shares, and to borrow £25,000. The dividends on the new shares are limited as usual, and these shares are, of course, to be sold by auction or tender. The last Act obtained by the Company was passed in 1868, so we have here the General Act of 1871 incorporated. The testing-place is to be that at present existing at the works; the test burner is to be Sugg's new "London," No. 1, and gas of not less than fourteen-candle power is to be supplied.

The *Hartlepool Gas and Water Bill* is to confer additional powers upon the Hartlepool Gas and Water Company. The Company have already raised capital to the amount of £200,000, and also borrowed £50,000, all of which money has been expended on their undertakings. Power is now sought to raise another £200,000, and to borrow to the usual extent. The dividend on the new capital is limited to seven or six per cent., according as it is raised. As this is a mixed undertaking, neither auction clauses nor the sliding scale is proposed. Gas of fourteen-candle power, tested by Sugg's new "London" Argand, is to be supplied, and a testing-place is to be erected at the works within twelve months. No alteration as to the price of gas is proposed.

The *Radcliffe and Pilkington Gas Bill* is to confer extended powers on the Radcliffe and Pilkington Gas Company, who have raised and expended upon their undertaking £100,500. Power is now sought to raise additional capital to the amount of £120,000, and to borrow in the usual proportion. The dividend on the new capital is limited as usual. No auction clauses are inserted in the Bill. To comply with the provisions of the General Act of 1871, it is proposed to enact that the existing testing-station shall be deemed sufficient for the purposes of the Act, and that the gas shall be tested by a fifteen-hole Argand burner, with a seven-inch chimney.

The *Torquay Gas Bill* is to authorize an extension of the powers of the Torquay Gas Company, who have already raised and expended share capital to the extent of £45,000, and have borrowed £5000. Power is now sought to raise £30,000 by the issue of new shares, and to borrow to the extent of one-fourth of that sum. The dividend on the new capital is limited as usual, and the shares are to be sold either by auction or tender. Gas of fourteen-candle power is to be supplied, tested by Sugg's new "London" burner.

The *York United Gas Bill* is to extend the limits and powers of the York United Gaslight Company. The new capital to be authorized by this Bill is to be £100,000, carrying the usual borrowing powers. Neither auction clauses nor sliding scale is proposed. Gas of fourteen-candle power is to be supplied, tested by Sugg's burner, and a testing-station is to be erected at the works within three months of the passing the Act.

In all the above Bills there is provision made for the payment of interest on money deposits.

The Bill of the Imperial Continental Gas Association is *sui generis*. The £50 shares of the Association have been paid up to the extent of £43 15s., and as they have expended large sums out of revenue on extensions and improvements of their undertakings, the object of this Bill is to obtain power to write up all the capital as fully paid, and convert the shares into stock. The Bill further seeks power to repeat this operation whenever the opportunity occurs, and also to reduce the nominal amount of capital, whenever it is deemed desirable, by returning money to stockholders in proportion to their several holdings.

Ten Bills are promoted, either to effect the compulsory purchase of Gas Companies by Local Authorities, or to sanction agreements for purchase already entered into between Companies and Local Bodies.

The *Bangor Local Board Bill* is promoted to empower the Local Board to make a compulsory purchase of the Bangor Water and Gas Company. The Bill gives no indication of the terms of purchase, which, if the Bill should pass, will be settled by arbitration or agreement.

The *Clitheroe Gas, Water, and Improvement Bill* is, *inter alia*, to sanction the purchase of the Clitheroe Gas Company by the Corporation, upon terms already arranged. The consideration for the purchase is annuities of five per cent. upon Class A and B shares, ten per cent. on C and D shares, and seven and a half per cent. to the holders of ordinary shares, together with a bonus of £3325 for uncalled capital and back dividends. The transfer was to have taken place on the 1st of July last, up to which time the Company received all moneys and discharged all debts.

The *East Retford Borough Bill* is, among other things, to enable the Corporation of the Borough to acquire the undertaking of the East Retford Gas Company. The consideration to be paid is a lump sum of £24,000, or, if the Shareholders prefer, annuities. The transfer is to take place on the 1st of July next, up to which date the Shareholders may receive ten per cent., and, if profits allow it, a further sum to make up back dividends. If the purchase be not completed on the day named above, the purchasers are to pay interest at the rate of five per cent. Until the purchase is completed, the vendors are to continue to carry on the undertaking for their own benefit, it being stipulated that in the meantime no further liabilities be entered into without the consent of the Corporation. The Corporation seek power to borrow as much money as they require for the execution of this Bill.

The *Leicester Corporation Gas Bill* is to sanction the transfer of the Leicester Gas Company to the Corporation, upon terms which have been agreed upon. These have been stated more than once in our columns, but may here be briefly recapitulated. The Corporation undertake to pay the owners of C shares £20, B shares £21 8s. 7d., and A shares £32 17s. 2d. per share, and the payment is to be made by the issue of an equivalent amount of debenture stock, bearing interest at four per cent. The Corporation assume the mortgage debt, which will constitute a first charge on the profits of the undertaking, and of the borough fund. The debenture stock may be redeemed by the Corporation at a rate not exceeding twenty-five years purchase. Power is sought to borrow the amount necessary to pay the cost of obtaining this Act, also a sum not exceeding £55,000 to pay off the mortgage debts of the Gas Company, and a further sum of £200,000 for gas purposes. It is proposed to apply the surplus profits of the undertaking to the District Fund.

The *Limerick Corporation Gas Bill* is to authorize the Corporation to purchase the gas undertaking of the United General Gas Company. The consideration to be paid is £26,000. The Corporation seek power to raise £54,000. Gas of fourteen-candle power is to be supplied, at a maximum of five shillings per thousand feet within the borough, and six shillings beyond that limit. Meter-rent is included in the price of gas. Surplus profits to be carried to the Improvement Fund.

The *Mansfield Commissioners Gas Undertaking Bill* is to authorize the transfer of the Mansfield Gaslight Company's undertaking to the Mansfield Improvement Commissioners. The consideration to be paid for the transfer is £37,500. The Commissioners assume the mortgage debt. A small compensation is made to the Directors and Secretary of the Company, and it is proposed to allot £300 to the widow of the late Manager of the Company, Mr. Kitching. The Commissioners seek power to issue debenture stock at four per cent., to the amount of the purchase-money. Surplus profits, when gas is charged at 4s. per thousand, or under, may be carried to the paving-rate. When the price exceeds 4s., such profits must be applied in reduction of price.

The *Newbury Borough Extension Bill* is, among other things, to authorize the Corporation of Newbury to take over the undertaking of the Newbury Gas Company. The gas-works stand on Corporation ground, of which the Company had only a fourteen years lease, and an agreement had been made that, when the lease expired, the undertaking should be sold to the Corporation at a valuation. Power is sought by this Bill to borrow £25,000 to complete the purchase. The prescribed quality of

the gas is fourteen candles, at a maximum price of 5s. 6d. per thousand cubic feet. Surplus profits are to be paid to the Borough Fund.

The *Newry Gas Bill* is intended to effect a compulsory purchase of the Newry Gas Company. It is proposed that within six months of the passing of the Act the Commissioners of Newry may give notice to the Company, who thereupon will be required to sell, either by agreement or arbitration. If they obtain the undertaking, the Commissioners propose to supply fourteen-candle gas, at a maximum price of 5s. per thousand cubic feet. Any balance of profit it is intended to devote to the improvement of the town and benefit of the inhabitants.

The *Stoke-upon-Trent Corporation Gas Bill* is to confirm an agreement entered into between the Corporation of the Borough and the Stoke, Fenton, and Longton Gas Company for the transfer of the gas undertaking of the latter. The capital of the Company is £34,000, and the consideration for the purchase agreed upon by the Corporation is £85,000, the Company retaining their reserve-fund. The transfer is to take place on the twenty-ninth of September next, until which date the Company carry on their undertaking as usual. The purchase is to be carried into effect by a joint Committee of the Corporation and the Local Board, each of which bodies seek power to raise £55,000 for the purposes of this Act. The maximum price of gas is to be 5s. per thousand. Surplus profits are to be divided between the two authorities, in proportion to the quantity of gas consumed in their respective districts.

The *Sutton-in-Ashfield Gas Bill* is to effect the transfer of the Sutton-in-Ashfield Gas Company to the Corporation, on terms already agreed upon between them. The consideration to be paid for the undertaking is £16,250. The Local Board seek to borrow on mortgage £30,000, and as much more as the Local Government Board may see fit to allow.

In all these Bills the borrowed money is to be paid off by means of a sinking-fund at various periods, ranging from sixty to eighty years. The usual notice of the allotment of the money for the purpose is to be sent to the Local Government Board.

Seven Bills are promoted to confer additional powers on Local Authorities in respect of their gas undertakings.

The *Burton-upon-Trent Commissioners Bill* is to enable the Commissioners to construct additional gas-works, for which, and other purposes, they ask power to borrow £10,000.

The *Castleford Local Board Bill* is a competing Bill, promoted to obtain authority for the Board to make and maintain gas-works to supply their own district, Whitwood, and several other surrounding parishes and parts of parishes. The Board propose to supply fourteen-candle gas, at the maximum price of 4s. per thousand. Power is sought to borrow £60,000.

The *Dalton-in-Furness Local Board Bill* is to authorize the Local Board, who have power to, and do to a small extent, manufacture gas, to purchase the Dalton works of the Barrow-in-Furness Corporation. The consideration agreed upon is £2000. Power is also asked to construct additional works, with the consent of the Local Government Board. The Board propose to supply fourteen-candle gas, at a maximum price of 5s. 6d. per thousand, and to erect a testing-station before they commence the supply. The Board seek to borrow £17,000 in respect of their gas undertaking, and wish to apply the surplus revenue to public purposes.

The *Drumcondra, Clonliffe, and Glasnevin Township Bill* is to consolidate the districts named into one township, and to authorize the election of a body of Commissioners for the purpose of local self-government. Among other things, it is proposed to give the Commissioners power to contract for the supply of gas.

The *Hamilton Burgh Bill*, while providing for several improvements in the burgh, so far as it relates to gas, only continues the authority of the Town Councillors to make and supply gas.

The *Maryport Improvement Bill* is, among other things, to authorize the Improvement Commissioners to alter the price of gas, which is now to be 4s. per thousand cubic feet, with a discount of ten per cent. to large consumers who pay promptly. In case of insufficiency of revenue of the gas undertaking to meet the demands upon it, the Commissioners seek power to levy a special gas-rate; but no such rate is to be levied when gas is sold under the maximum price.

The *Nottingham Improvement, Gas, and Water Bill* is, among other things, to enable the Corporation to construct additional gas-works, for which purpose they ask power to borrow, but what sum is to be applied for gas purposes is not stated in the Bill.

BOARD OF TRADE REPORT ON THE GAS AND WATER BILLS, SESSION 1878.

The Board of Trade have presented their usual report to the House of Commons, at the commencement of the session, upon all the Railway, Canal, Tramway, Gas, and Water Bills to be promoted this year.

Gas and Water Bills.—72 Bills have been deposited. Of these 27 relate to the supply of gas only, and 12 to the supply of gas and water, 18 being proposed by Corporations of cities, or Local Boards, 6 by new Companies, and 15 by existing Companies.

Thirty-three Bills relate to the supply of water only, 15 being proposed by Corporations of cities, or Local Boards, 6 by new Companies, and 12 by existing Companies.

The total of the sums proposed to be raised by these 72 Bills amounts to £9,683,273.

Gas and Water Provisional Orders.—22 applications have been made to the Board of Trade for Provisional Orders, 10 for purposes relating to the supply of gas, 8 relating to the supply of water, and 4 relating to the supply of both gas and water.

The total sums proposed to be raised by these Provisional Orders amount to £359,000.

The capital proposed to be raised for water-works purposes does not include the sums to be expended by the Metropolitan Board of Works if their schemes are successful. The estimated outlay in this case is unspecified.

GAS ENGINEERS' AND SUPERINTENDENTS' POCKET ALMANAC FOR THE YEAR 1878.*

This handy little publication is issued by the American Meter Company, and, of course, is intended more for Transatlantic Gas Engineers and Managers than for those in this country; but there are many items of information scattered through its pages, which will be useful to gas officials in any part of the world.

Besides the usual almanac, the work contains a Gas Engineers Calendar, with lighting tables for each month, and columns for registering the daily make and consumption of gas, the quantity in stock, and the weight of coal carbonized, with the yield of gas per pound of coal. The production is usually reckoned per pound of coal in the States, though we do not know that there is any advantage in this over our own plan of calculating by the ton. The book also contains instructions for testing meters, a number of photometrical and other tables, and blank leaves for memoranda. Even the advertisements are interesting, as exhibiting some of the peculiarities of our "American Cousins" in this line of business.

LIGHTING BY ELECTRICITY.

(*Continued from page* 121.)

Of course, it would be out of the question to pretend to judge the expected merits of Fontaine's lamp (referred to last week) from what we have now before us; we therefore simply remark that whatever may be the result of trial, the improvement, if any, will not be found in the simplicity of its arrangements, consequently the question that has been so often asked concerning lamps of this nature, from 1845 to the present day, remains as pertinent as ever. "Why all this complication, seeing that the King lamp was so simple?" The answer obviously is: "Because the keeping two or more lamps in action on the same *circuit*, in such a manner that one cannot interfere with another, whether alight or otherwise, is so perplexing." The light of the incandescent lamp is produced, as we have before remarked, by the emission of rays from a piece of platinum or carbon, heated up to a point below that of fusion. At any rate, this expression is correct as far as platinum is concerned, and the reason for not continuing to use it, as first suggested in King's specification, is the difficulty of keeping below that point. Hence the use of carbon is generally resorted to; that substance being capable of undergoing the intense heating required, without fusion, at the same time remaining (whilst intact) a good conductor of electricity, and the light being formed without a breach, as is the case when produced by the voltaic arc, the circuit is complete in every respect. But carbon, when ignited, has a great affinity for oxygen, and to prevent its combustion when in the glowing condition necessary for the manifestation of light, the lamp must be so constructed as to admit of being exhausted of air, and capable of resisting a vitiation of the vacuum formed during the time such light has to be maintained. This renders the lamp cumbrous, and the re-formation of the vacuum every time the lamp is opened is not a recommendation. Although the carbons do not fuse, they often fall to pieces and otherwise give trouble, the extent of which may be gathered by a description and drawing of the Konn lamp, which was designed especially to compensate some, if not all, of the perplexities of this mode of developing light, and at the same time to preserve an unbroken circuit for other lamps in advance. When this lamp is fully trimmed it has five carbons of the same length, set in a circular plate, which is in metallic contact with the negative conductor. The upper ends of these carbons enter the socketed ends of five copper rods, of slightly varying lengths, so that by this means a metal plate hinged to the positive conductor, and overlying them all, only touches one at a time. The electric current when turned on passes first through the one in contact with the hinged conductor, and as long as this carbon remains intact produces incandescence; the carbon at the same time acting as a part of the circuit. When this carbon breaks, the plate falls to the next tallest, and so on, until all the carbons are broken. The plate then rests on the end of a metal rod, which keeps the circuit com-

* Issued by the American Meter Company, Philadelphia.

plete, should the current be required onward. M. Fontaine thus describes the Konn lamp:—

In 1875, M. Konn, of St. Petersburg, patented a more practicable lamp (represented in fig 14), which was constructed for the first time in France by M. Duboscq.

This lamp is composed of a copper base, A, upon which are fixed two spur-posts, N, for attaching the conductors; two copper rods, C, D, and a small valve, K, opening outwards from within. A globe, B, enlarged in its upper part, is held upon the base by means of a bronze nut, L, pressing upon an india-rubber ring. One of the vertical rods, D, is electrically isolated from the framework, and communicates with a spur-post, also isolated. The other rod, C, is composed of two parts—first, of a tube fixed directly upon the base, without isolation; and, secondly, of a piece of copper rod, slit for a portion of its length, thus giving it elasticity, and allowing it to slide in the tube, but to remain fixed unless a certain effort is brought to bear upon it. The retort carbons, E, to the number of five, are placed upon the two small plates surmounting the copper rods, C, D. Each carbon is introduced into two small blocks, also of carbon, which receive copper rods at their extremities. These rods are alike at their lower part, but of unequal length at the upper part. A hinge-joint, I, is articulated upon the rod, C, and rests upon the rod of a single carbon at a time.

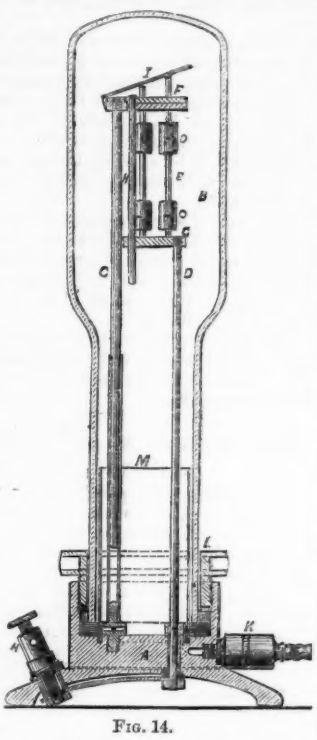

Fig. 14.

If the lamp be placed in a circuit, by attaching the two conductors of a pile to the spur-posts, N, N¹ (the latter is concealed by the former, but it is identical in character, and is not isolated from the base), the carbon rod, E, is traversed by the current, which passes through the medium of the hinge-joint, I, the copper tube, F, the two blocks of carbon, O, O, the copper rod, G, and the plate surmounting the rod, D. A vacuum has previously been produced by attaching to the valve, K, the pipe of an air-pump, or any other pneumatic machine. The carbon rod, E, reddens, becomes white, and then luminous. At first the light is white, steady, and constant; then by degrees the section diminishes, the carbon breaks, and the light disappears. The hinge-joint, I, then falls upon another carbon rod, and the light is re-established almost instantaneously. When all the carbons have been used up the hinge-joint rests upon a copper rod, H, and the current remains unbroken. In this manner, if several lamps are supplied from the same generator of electricity, the extinction of one does not involve the extinction of the others.

In order to avoid the projection of pieces of broken carbon against the glass, M. Konn places in the lower part of his lamp a thin copper tube, M, which receives the fragments until the plates are again replenished.

Three of these lamps, worked by an Alliance machine, have been in operation for the past two years at the establishment of M. Florent, a merchant in St. Petersburg. Each carbon lasts about two hours, with the exception of the first, which is almost immediately consumed. The light is very agreeable, but costs considerably more than gas.

The principal cause of the great expense attending the light, while burning, is the difficulty of preparing the small carbons, the market price of which is over 5 francs per mètre.

Resuming our extracts from M. Fontaine's chapter on "The Divisibility of the Light," we remark that the author introduces us rather suddenly to some experiments, by M. de Changy 20 years ago, that appeared big with expectations, at that time, respecting the divisibility of the electric current for lighting purposes. He says:

It has never been quite understood how M. de Changy operated; all that can be said is that his laboratory experiments were perfect, especially when judged by the following communication made to the Academy of Sciences on Feb. 27, 1858:—

"I hasten to communicate to the Academy the important discovery of the divisibility, for lighting purposes, of the electric current coming from a single source, in as many wires as may be desired, from a night-lamp to a beacon light.

"It is known that the luminous arc produced between two carbons is capable of giving but one focus—very intense, very unstable, very disagreeable, and very costly. M. de Changy, a young chemist, who is at the same time a physicist, mechanician, and practitioner, thoroughly conversant with the new discoveries and instruments, has just solved the problem of the divisibility of the galvanic current.

"It is after having just left his laboratory, where he has been working alone for the past six years, that I proceed to give a brief sketch of what I there saw—namely, a pile of twelve Bunsen elements perfected by him, producing a constant luminous arc, without intermittence or crepitation, between two carbons brought nearly together by a regulator of M. de Changy's invention, which is the simplest and most perfect that I am acquainted with; there were likewise a dozen small miners lamps, moveable upon rods or copper wires. Any one of these lamps, or the entire number, could be lighted or extinguished at pleasure, without affecting the intensity of the light in the neighbouring lamps. The light was as white and as pure as that of the Gillard gas, with which it has this point of similarity—that it is produced by the incandescence of the platina. The lamps were enclosed in glass tubes, hermetically sealed, and were intended to be employed in lighting mines, or for placing in street-lamps, the entire number of which in a town could be lighted or extinguished by opening or closing the circuit. The gas conduit-pipes would then be replaced by simple wires, and consequently neither explosions, fires, nor bad smells would be occasioned.

"All attempts to produce the electric light by the incandescence of platina have up to now been unsuccessful, in consequence of the wires melting for want of a regulator to divide the current, and it is this problem that M. de Changy has solved most completely. He estimates that this light will not cost one-half as much as gas. A lamp placed at a mast-head would make a permanent signal, which would last more than six months without the platina requiring to be changed. If several lamps were placed in tubes of coloured glass, as they could be lighted or extinguished rapidly from below, nothing would be more easy than to convert them into night telegraphs. With regard to coast signal-lights, the focus could be made of such a size that its luminous range would exceed that of all the lighting apparatus known up to now.

"I also saw a luminous spot in thick glass, which could be immersed in water to considerable depths without being extinguished by movement. It has already been tried in a river, and has served for catching fish, which are attracted and not frightened by the light. It is probable that in the course of time the inexhaustible sea will nourish the earth, and that miraculous draughts of fishes will be so no longer.

"This short sketch will suffice to show you to how many different purposes this discovery may be applied—a discovery to which I have the honour of calling the attention of the Academy, with the conviction that I have not been the dupe of an illusion, notwithstanding my astonishment at seeing a lamp light itself in the hollow of my hand, and remain alight when covered with my handkerchief and put into my pocket."

It must not be supposed that this communication was made by a person who was a stranger to science, and susceptible of allowing himself to be deceived by an enthusiastic inventor. No. It emanated from the vigorous mind of that living scientific repertory, M. Jobart, of Brussels.

We have not been able to procure the drawings of the dividing regulator invented by M. de Changy, but have seen the one contrived by MM. Lacassagne and Thiers, which they patented in 1854. The theory of this apparatus rested upon the following observations, which we extract from the patent.

It is known that when, in order to reach its destination, a current is obliged to pass through a liquid of less conducting power than the conductors employed, the intensity, or the quantity of electricity set in motion in a given time, is in inverse ratio to the resistance offered by the interposed liquid. This resistance may be increased or diminished either by increasing or diminishing the conductivity of the liquid, or by increasing or diminishing the immersed surface. It is also known that the magnetic power of an electro-magnet varies with the intensity of the current; that when the surfaces of the immersed conductors are composed of an unalterable metal, the gas resulting from the decomposition of the liquid may be obtained in a free state; and that, finally, the quantity of gas obtained in a given time is in direct ratio to the intensity of the current.

In order to place these principles in a condition to produce the desired result, MM. Lacassagne and Thiers cut one of the conductors of a pile in action, in two, attached a plate of platina to each extremity, and suspended the plates in the interior of a glass gasholder bell. The gasholder contained some acidulated water. The glass bell rose or fell according as the gases formed were or were not allowed to issue. The rising of the bell naturally produced a diminution of galvanic intensity, while its descent produced the opposite effect. An electro-magnet furnished with a lever armature, having a counteracting spring, completed the arrangements.

The apparatus worked as follows:—First of all the spring attached to the electro-magnet was regulated in order to obtain a determined current. So long as the magnetic attraction was greater than the tension of the spring, the armature remained in contact, and the gases produced by the decomposition of the water not being able to escape, caused the bell to rise, thus lessening the points of contact of the plates of platina, and consequently the intensity of the current. There came a moment when equilibrium was established, and even when the strength of the spring exceeded that of the magnetism; the armature of the electro-magnet then receded, opened a tap by which a small quantity of gas escaped, and then things once more quickly took their normal course. In a well-arranged regulator the tap remained constantly partly open, and the armature was brought very near to the electro-magnet, but without ever touching it.

It is easy to conceive that a similar regulator applied to each of M. de Changy's small lamps would prevent the platinum wires from burning; but the complication that would result from this combination would render it absolutely inapplicable, even should there be no other inconvenience in practice.

MM. de la Rive and Elie Wartmann, both physicists at Geneva, have observed that with a well-acting pile and a very sensitive regulator the current may be broken for the thirtieth part of a second without any variation taking place in the arc, but that if the interruption lasts longer, the arc becomes fainter, and goes out altogether when the current has ceased for the tenth of a second.

Profiting by this observation, Mr. Le Roux obtained some very good results, which he communicated to the Academy of Sciences on Dec. 30, 1867. The following are some extracts from his communication:—

"The spark from the electric pile is generally incapable of jutting out between two separated conductors. [It has required 3500 elements, isolated with great care, to produce a spark of only a fraction of a millimètre in length.] The induction currents produced by the magneto-electric machines have a greater tension, and this explains the light produced by these machines with uncorrected currents.

"I have obtained the same results with a pile of 50 Bunsen elements; the current, which had been broken for the 25th part of a second, jutted out to the space of 3 millimètres. This fact would probably not be without interest as regards the applications of the electric light. I see in it a solution of the problem of the divisibility of this light, which up to now has been unsuccessfully attempted. However, a few conclusions may be deduced from this experiment. When the current passes between two conductors in such a manner as to produce the voltaic arc, it now appears probable that this passage was not conditional upon the voltaic arc itself, but upon the elevation of the temperature. The conductivity of the interposed medium is probably only an extension of that found by M. Edouard Becquerel in heated gases, and which would be considerably increased as a consequence of the very great elevation of the temperature. The carbon forming the electrodes may also at this temperature have a sensible vapour tension, and this vapour may help to increase the conductivity of the medium."

Mr. Le Roux has thus been able to divide the light, by sending, with the aid of a distributory wheel revolving with great rapidity, the current from a Bunsen pile alternately into two regulators, in such a manner that it should pass into each of them during the same number of fractions of a second. Under these conditions the two lights were perfectly equal.

In 1873 M. de Mersanne took out a patent for dividing the electric currents upon the principle adopted by M. Le Roux. The invention deals with principles of mechanical construction so elementary, so well known, and so little susceptible of being made the subject of a patent, that we should not even have referred to it, had not M. de Mersanne in the following year taken out an additional certificate showing an arrangement which, if not practicable, was at least original.

In this arrangement the distributory wheel employed by M. Le Roux is replaced by a horizontal shaft bearing a series of arms. Friction

rollers articulated to metallic rods receive from these arms an alternate movement, and cause several vertical rods to plunge into small cups filled with mercury. By moving the shaft with great speed, several lamps may by this means be successively put in contact with the voltaic current, and thus a single source of electricity be divided into several equal or unequal parts, according to the combination of the interrupters.

Last year, when passing through the great cities of the United States, we endeavoured to find out what had been done there in the matter of the electric light, and we nowhere found that it had received the slightest practical application. Several scientific men spoke to us of the attempts they had made to divide the current; but not one of them could show us an apparatus worthy of mention. We will simply notice, as being the most recent, the patent taken out by Mr. Henry Woodward, in 1876, relative to the incandescence of a carbon in a rarefied gas which possessed the property of not combining chemically with the red-hot carbon.

(To be continued.)

Communicated Article.

ON A RAPID AND ACCURATE METHOD OF ESTIMATING SULPHUR IN COAL GAS.

By Mr. W. C. Young, F.C.S., Etc.

Public Analyst for the Poplar District, and Gas Examiner at Beckton to the Corporation of the City of London and to the Metropolitan Board of Works.

The process in use at the testing-places under the control of the Gas Referees, for the estimation of sulphur in coal gas, although giving accurate results in the hands of experienced operators, is attended by so many difficulties, and takes so much time for its completion, that it is not surprising that a general wish should be felt for some means which would enable gas managers, without special training, to obtain equally accurate results, with the same apparatus, in a very much shorter space of time.

The process about to be described is based upon sound chemical principles, gives more accurate results than the one commonly in use, takes a very short time to complete, and, moreover, the chances of error are so slight, that a person of ordinary intelligence would obtain, for all practical purposes, as perfect results as the most experienced chemical manipulator.

Before proceeding to details of the method, and in order to explain its principle, it is necessary to consider the nature of the substances to be dealt with.

In the liquor given by the Referees apparatus, there are present carbonate of ammonium and sulphate of ammonium. Before converting the latter compound into sulphate of barium, it is necessary to decompose the former, which is effected by boiling the liquid with an excess of hydrochloric acid, chloride of barium being afterwards added. There is then present the excess of chloride of barium, hydrochloric acid, chloride of ammonium, and sulphate of barium.

Now, as hydrochloric acid and chloride of ammonium are readily volatile, whereas chloride of barium is not, it follows that, if the quantity added of the latter be known, then the amount left, after volatilizing the two former, must be the excess of chloride of barium added, the difference being clearly due to the chloride of barium required to decompose the sulphate of ammonium.

The chlorides admit of easy estimation; indeed, the process by which it is effected is at once the most accurate and simple in the domain of volumetric analysis; so that we have in this way a ready indirect means of ascertaining the amount of sulphate of ammonium contained in the liquor given by the Gas Referees apparatus.

My mode of applying this principle is as follows:—The apparatus is used in the ordinary way, excepting that an upright eduction-tube 12 inches long is employed, in order that the bulk of the liquor obtained may be small. If 10 cubic feet have been burned, the liquor and washings are made up to 500 septems (half a deci-gallon), well mixed, and 25 septems (1-20th part) measured by a pipette for the experiment. To this is added a slight excess of acetic acid (two drops is generally sufficient) and 10 septems, measured by a pipette, of a standard solution of chloride of barium, containing 1625 grains in one gallon. The whole is then transferred to a shallow flat-bottomed platinum capsule, and evaporated to dryness over a burner. The evaporation can be conducted over an Argand or rose Bunsen burner, the heat being adjusted so as to keep the liquid just below boiling, and so prevent possible spurting; but, where a number of estimations are being made simultaneously, it is best done on a water or steam bath. After evaporating to dryness, the residue is gently heated until the crucible is at a slight red heat; it is then cooled, and the contents washed out with water into a small beaker. To this solution an excess of a solution of yellow chromate of potassium is then added, and a standard solution of nitrate of silver, containing 531·2 grains per gallon, is added from a burette containing 50 septems (graduated into fifths of a septem), until a permanent change of tint is observable on shaking the liquid.

Each septem left in the burette indicates one grain of sulphur per 100 cubic feet of gas, and each division ·2 grain.

As many of those for whose benefit this process is intended may be unacquainted with the use of a standard solution of nitrate of silver for estimating chlorides, a few words explanatory of the process may not be out of place here.

When a solution of nitrate of silver is added to a mixture of soluble chromate and chloride, there is produced at first a deep red precipitate of chromate of silver, which is immediately converted into the white chloride of silver, the colour at once disappearing. This action goes on until the whole of the chlorides present have been precipitated, and then the deep red chromate of silver formed is unaffected, and so marked is the change in the colour, that one drop in excess of the standard solution of nitrate of silver employed in my process produces such a decided red tinge, that no one could be mistaken. This one drop would introduce an error of less than ·2 grain of sulphur per 100 cubic feet of gas.

The process of evaporation, as directed, takes at the most fifteen minutes, the rest of the work needing a few moments more, and as the result must necessarily be at least as accurate as that given by the tedious gravimetric method, the process will, I have no doubt, commend itself to those who desire to know in a short time the sulphur contained in the gas under examination.

Moreover, should the result of a test appear at all extraordinary, it can readily be checked by a repetition, or by a separate gravimetric estimation, as only a very small quantity of the liquid is used.

Should the gas contain more than 50 grains of sulphur per 100 cubic feet, it will be necessary to make the bulk of the liquor up to one deci-gallon (twice the quantity before directed), proceed as usual, and multiply the number of septems of standard nitrate of silver solution remaining by two, to find the amount of sulphur present.

If a "short" test is desired, one-half of a cubic foot should be burnt, when, if the whole of the liquor be taken, the number of septems of standard nitrate of silver solution remaining will indicate the number of grains of sulphur per 100 cubic feet.

All the apparatus needed for this process, together with the standard solutions, guaranteed correct, may be obtained of Mr. Sugg, Vincent Works, Vincent Street, Westminster.

Gas Examiner's Laboratory, Beckton Road, North Woolwich, London, E., Jan. 21, 1878.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

AITKEN AND YOUNG'S PROCESS.

Sir,—During the discussion of Mr. Young's paper read at the West of Scotland Association of Gas Managers Meeting, held at Greenock, in April, 1876, and reported in your issue of May 23, 1876 (p. 781), Mr. Key made the following remarks:—"I remember calling upon Mr. Walker, of Ayr, late of Kilmarnock, and I noticed he had a large hydraulic main, 3 feet square, over his benches. I have no doubt the object he had in view was to pick up the hydrocarbons in travelling over a heated surface. I think that must have added to his gases very much. I remember a few years ago having a tank, into which I ran the liquors from the hydraulic main, and I kept it up to the boiling point. I made a large volume of gas at the time—upwards of 13,000 cubic feet. When the liquors in the tank came up to the boiling-point they would boil over, and that was dangerous, because of the fire. One day the tank boiled over, and I got a good scald, The object, however, is a correct one, and the application of steam is a nice idea, because you have steam more under control. I must say the whole thing is got up in a very natural and scientific manner; and as to the results, I thoroughly concur with Mr. Young."

From these remarks it will be evident that, at the date of that meeting, Mr. Key was of opinion that the object of the process was a correct one, and that the passing of the gases over heated tars would add to their value very much. Indeed, it would appear, or, rather, Mr. Key insinuates—or, at least, leaves his hearers to infer—that he had been aware of that fact for some time, since he had a few years previously employed a tank, in which he heated his tars with a similar object, and that it was solely in consequence of fire being dangerous that he abandoned the use of the arrangement. He pointed out, however, that the use of steam in the Aitken and Young process entirely obviated this defect.

How can Mr. Key reconcile those statements with the assertions in his letter which appeared in your issue of the 15th? He there tells us that he employed the fire to the tank referred to for an entirely different purpose, that it was applied not with the view of volatilizing the naphthas into the gas, but for the purpose of melting the tars collected from his hydraulic main, those tars being so thick and pitchy that they would not otherwise flow to the tar-well, in consequence of the mode in which he conducted the carbonizing of the coal decomposing all the naphthas into gas, and thereby producing 13,800 cubic feet of gas per ton of coal carbonized.

The following monthly statements of the gas manufactured in Dumbarton Gas-Works in the year 1872-73, will show how badly his recollection has served him on this occasion:—

Month.	Make per Ton. Cubic Feet.
From May 16 to June 30, 1872	9,986
July 1872	9,625
August "	7,168
September "	10,701
October "	10,414
5)	47,894
Average	9,578
November, 1872	12,117
December, "	13,327
January, 1873	12,696
February "	12,637
March "	12,337
April "	10,825
6)	73,939
Average	12,323

In the first, or summer six months, you will observe that the actual average make per ton was 9578 feet, that given by Mr. Key being 11,600 feet, making a deficit of 2022 cubic feet per ton. In the winter months you will also note that the actual average make was 12,323

feet (not a bad make), instead of 13,300 feet, as given by Mr. Key, making a deficit of 977 cubic feet per ton.

Those results, also, Mr. Key asserts, he obtained "by the ordinary process, and that by no means in perfect order." Whereas, in reality, Mr. Key was using a setting of retorts for which he had applied and obtained a patent. I am not sure whether, during this year, the settings were wholly adopted, but I know they were so partially, and in the following year they were wholly introduced, with the following results:—

Month.		Make per Ton. Cubic Feet.
July	1873	9,629
August	"	10,276
September	"	10,533
October	"	11,271
November	"	10,243
December	"	10,156
January,	1874	10,068
February	"	10,169
March	"	9,653
April	"	7,120
May	"	7,116
June	"	5,906
		12)112,140
Average		9,345

One would have thought that Mr. Key's position would have made him hesitate before writing the extraordinary letter, which recently appeared in the JOURNAL. He must have been aware that the process in question was being carefully investigated at one of the Glasgow Gas-Works. It is a great pity he did not wait until Dr. Wallace's report was published. This would have had the effect either of deterring him from making such a communication, or, if he still persisted in his own opinion, he might then have added another sentence to his letter, somewhat to this effect—that, notwithstanding the acknowledged high abilities of the experimenters, the Dalmarnock Gas-Works were, like those at Hamilton, ripe for improvement in some way or another unknown to them.

JAMES M'GILCHRIST.

Gas-Works, Dumbarton, Jan. 22, 1878.

SALES OF GAS ACT.

SIR,—As it seems not improbable the above Act may be remodelled this session (and, if so, not before it is needed), I beg to throw out the suggestion that the Board of Trade would make the amended Act none the less valuable, by asking for the opinions and experiences of many of the most experienced inspectors in the provinces, as well as of those in the Metropolis. Meter makers will give valuable information, of course, but more from their own stand-point of view as manufacturers; but, on the other hand, I think the inspectors, who are brought more into contact with the consumers of gas, and whose experience and knowledge of meters of various makers is manifold, could also give much useful information, not only as to the need of a more thorough and efficient test being required, but in what form it is most desirable to make it, so as to secure an impartial and reliable instrument in the measurement of gas.

JAMES URQUHART.

Gas-Meter Testing Office, Bootle Street, Peter Street, Manchester, Jan. 25, 1878.

BRITISH ASSOCIATION OF GAS MANAGERS.

SIR,—In a few months the Annual Meeting of the British Association of Gas Managers will be held. I am sure you will agree that it is the duty of every member to contribute, as far as he can, to increase the interest of the meetings. With this view, I take the liberty of suggesting that an exhibition be held, at least every alternate year, in connection with the Association; the exhibition to consist of models of the most recent improvements in apparatus for the manufacture and distribution of gas, and the application of gas to domestic, manufacturing, and scientific purposes.

Prizes are awarded by the Association for the best papers read at the meetings, and if, in the same way, prizes were awarded for the most suitable cooking and heating apparatus, for the best burner, and the most economical gas-engine, I am sure it would ensure a very satisfactory result.

At first sight it may appear that there are difficulties in the way of carrying out this project; but on reflection it will, I think, be seen that the amount of practical good which must result from it will more than counterbalance any difficulties.

Perhaps the first question to be asked is, From whence are the funds to be procured? In the success of the undertaking there are three classes interested—viz., Gas Companies, Manufacturers, and Members; and, as such, each has a duty to perform. I am sure that Gas Companies will readily recognize their part, and contribute sufficient funds. When you look at the number of well-to-do Gas Companies in existence, a comparatively small contribution from each would be ample.

The Manufacturers of gas apparatus will not only, indirectly, bear a portion of the expenses, by sending their goods free of cost, but many, I have no doubt, will be found to offer a contribution to the funds.

As to the Members, I certainly think they ought not to be expected to contribute in this way. Theirs is the intellectual portion, and every encouragement should be offered to them to give the results of their improvement in the shape of working models and drawings. Permit me to remark that, in my opinion, there are many who would not be tempted to read a paper, yet would take a pride in producing an ingenious model, the outcome of many hours of patient thought. Instances are not rare where, by such means, the germs of some of the most valuable discoveries first came to light.

But it may be said that the time of the meeting is fully occupied with reading papers, and the discussions which necessarily follow. Granted; but, when suggesting that the exhibition be held every alternate year, it is in my mind that London would be found the most central for carrying it out. I know from experience that the majority of the members from the provinces are to be found in town on the day previous to the meeting; and, if the exhibition were opened on that day, it would in no way interfere with the usual proceedings of the Association.

The evening of the exhibition could also be taken advantage of for holding an agreeable *conversazione*, at which the freedom of intercourse and the easy interchange of ideas would not be the least important feature in the undertaking.

THOMAS TRAVERS.

Cork, Jan. 24, 1878.

Parliamentary Intelligence.

GAS AND WATER BILLS, 1878.

A memorial complaining of non-compliance with the Standing Orders, in respect of the Waterford Corporation Water and Improvement Bill, has been deposited from Joseph Fisher and Nathaniel W. Allen, as members of the Corporation of Waterford.

HOUSE OF LORDS.

MONDAY, JAN. 21.

CONSERVANCY BOARDS.

Lord RIPON called attention to the Report of the Select Committee of last session on Conservancy Boards, and observed that the issue was so important that he felt that he had no reason to apologize for bringing the subject under consideration. He referred to the evils in different parts of the country occasioned by the prevalence of floods, which he attributed in a great measure to the improvement in subsoil draining; and conceiving that urgent measures ought to be adopted to check the evils produced by the floods, he asked the Duke of Richmond whether it was the intention of the Government to introduce in the present session a Bill founded on the recommendations contained in the report.

Lord HUNTLY made some observations on the subject of rating for the purpose of defraying the expense of drainage works, and suggested that Commissioners should be appointed by the Government to inquire into the different cases.

After some observations from Lord LONGFORD and Lord SANDWICH,

The Duke of RICHMOND and GORDON admitted that the question was one of considerable importance and magnitude, and as the subject-matter of the report was under consideration, he expressed a hope that the Government would be able to deal at least with part of the subject before the end of the session.

TUESDAY, JAN. 22.

The Lord CHANCELLOR acquainted the House that the Standing Orders applicable to the following Bills have been complied with:—Bangor Local Board; Cheltenham Water; Cockermouth and Workington Water; Durham Water; Grand Junction Water; Limerick Corporation Gas; Marske and Saltburn Gas; Nottingham Water; Shrewsbury Gas; Southport Water: and that the Standing Orders applicable to the Nottingham Improvement, Gas, and Water Bill have not been complied with.

THURSDAY, JAN. 24.

The Lord CHANCELLOR acquainted the House that the Standing Orders applicable to the following Bills have been complied with:—Burton-upon-Trent Commissioners; Cleveland Gas; Deal Water; East Grinstead Gas and Water; East Retford Borough; Manchester Corporation Water; Metropolis Water Supply; Normanton Gas; Radcliffe and Pilkington Gas; Scarborough Water; Sevenoaks Water; South Staffordshire Water: and that the Standing Orders applicable to the Cheltenham Corporation Water Bill have not been complied with.

FRIDAY, JAN. 25.

The Lord CHANCELLOR acquainted the House that the Standing Orders applicable to the following Bills have been complied with:—Batley Corporation Water; Bradford Water and Improvement; Cardiff Water; Castleford and Whitwood Gas; Dublin Corporation Water-Works Acts Amendment; Farnworth and Kearsley Gas; Truro Water; York United Gas.

Bill read the first time and ordered for second reading:—Burton-upon-Trent Commissioners.

Bill read the first time and referred to the Examiners:—Deal Water.

HOUSE OF COMMONS.

MONDAY, JAN. 21.

Mr. RAIKES reported that, in accordance with Standing Order, No. 79, he had conferred with the Chairman of Committees of the House of Lords, for the purpose of determining in which House of Parliament the respective Private Bills should be first considered, and that they had determined that the Bills contained in the following list should originate in the House of Lords:—Batley Corporation Water; Bedlington Local Board (Water); Castleford and Whitwood Gas; Castleford Local Board; Clitheroe Gas, Water, and Improvement; Dartmoor and Exeter Water; Deal Water; Dublin Corporation Water-Works Acts Amendment; Exeter Corporation Water; Exeter Gas; Forfar Water; Imperial Continental Gas Association; Leicester Corporation; Lichfield Gas; Mansfield Commissioners Gas; Newry Gas; Normanton Gas; South Staffordshire Water; Sutton-in-Ashfield Gas; Trowbridge Water; Warrington Water; Waterford Corporation Water and Improvement; York United Gas.

METROPOLIS WATER SUPPLY BILLS.—A petition against these Bills was presented from the Vestry of St. Pancras.

TUESDAY, JAN. 22.

Petitions were presented for the following Bills, which were ordered to be brought in:—Cockermouth and Workington Water, by Mr. Fletcher and Lord Muncaster; Durham Water, by Mr. Herschell and Sir Arthur Middleton; Limerick Corporation Gas, by Mr. Butt and Mr. O'Shaughnessy; Marske and Saltburn Gas, by Mr. Pease, Mr. Bolckow, and Mr. Dodds; Nottingham Water, by Mr. F. Smith and Viscount Galway; Shrewsbury Gas, by Mr. Cotes and Mr. Robertson; Southport Water, by Mr. Cross and Colonel Blackburne.

The Examiners report, "That the Standing Orders have not been complied with in the case of the petition for the Nottingham Improvement, Gas, and Water Bill," was referred to the Select Committee on Standing Orders.

Colonel BERESFORD gave notice that on Monday, Jan. 28, he would ask the Secretary of State for the Home Department whether he will use his influence to postpone the consideration of the Bill promoted by the Metropolitan Board of Works for the purchase of the Water Companies at a cost of many millions sterling, until that Board have, in accordance with the spirit of his recent reply to the Board, taken the necessary steps to prevent the recurrence of floods on the Surrey side of the water.

WEDNESDAY, JAN. 23.

Petitions were presented for the following Bills, which were ordered to be brought in:—Bangor Local Board, by Mr. R. Davies and Mr. Pennant;

Cheltenham Water, by Mr. Yorke and Mr. Agg-Gardner; Grand Junction Water, by Sir Henry Holland and Mr. Coope.

THURSDAY, JAN. 24.

Petitions were presented for the following Bills, which were ordered to be brought in:—Cleveland Gas, by Mr. Pease and Mr. Milbank; East Grinstead Gas and Water, by Mr. Grantham, Mr. Gregory, and Mr. Scott; East Retford Borough, by Mr. Foljambe and Mr. Beckett-Denison; Metropolis Water Supply, by Sir James M'Garel-Hogg, Sir Andrew Lusk, and Mr. Rodwell; Radcliffe and Pilkington Gas, by Mr. Egerton and Mr. Hardcastle; Scarborough Water, by Sir Charles Legard and Sir Harcourt Johnstone; Sevenoaks Water, by Mr. Goldney and Mr. Ryder.

Bills read the first time and ordered for second reading:—Bangor Local Board; Cockermouth and Workington Water; Marske and Saltburn Gas.

Bills read the first time and referred to the Examiners:—Cheltenham Water; Durham Water; Grand Junction Water; Limerick Corporation Gas; Nottingham Water; Shrewsbury Gas; Southport Water.

The Examiners report, "That the Standing Orders have not been complied with in the case of the petition for the Cheltenham Corporation Water Bill," was referred to the Select Committee on Standing Orders.

PUBLIC HEALTH (IRELAND) BILL.—This Bill was read a second time and committed.

FRIDAY, JAN. 25.

Petitions were presented for the following Bills, which were ordered to be brought in:—Bradford Water and Improvement, by Mr. W. E. Forster and Mr. Ripley; Cardiff Water, by Colonel Stuart, Mr. Morgan, and Major Lee.

The petition for the Cheltenham Corporation Water Bill was referred to the Select Committee on Standing Orders.

Bills read the first time and ordered for second reading:—East Retford Borough; Metropolis Water Supply.

Bills read the first time and referred to the Examiners:—Cleveland Gas; East Grinstead Gas and Water; Radcliffe and Pilkington Gas; Scarborough Water; Sevenoaks Water.

Legal Intelligence.

CLERKENWELL COUNTY COURT.—MONDAY, JAN. 21.
(*Before Mr.* WHITBREAD, *Judge.*)

NEW RIVER COMPANY *v.* KENDRICK.

Defendant was summoned for 2½ quarters water-rent, due May, 1876, for water supplied at 223, Junction Road, Upper Holloway, at the rate of £1 16s. per annum, and 5½ quarters water-rent, due September, 1877, for water supplied to 147, Junction Road, at the rate of £2 6s. per annum—total, £4 5s. 9d..

It appeared that, by their Act of Parliament, the Company are entitled to charge 4 per cent. on the annual value of the premises supplied with water, unless the premises are beyond 160 feet above Trinity high-water mark, when they are authorized to charge 5 per cent. on the annual value.

Mr. *Kersham*, the surveyor to the Company, and Mr. *Smith*, the foreman, gave evidence of the height of the cistern being above 160 feet higher than Trinity high-water mark, taking the level mark on the Congregational Church as appeared on the Ordnance map.

On the part of the defendant, *Francis Dodd*, clerk to defendant's solicitor, and father-in-law of defendant, who said he was very proficient in taking levels, described the cistern as not being above 160 feet, taking the measurement from the doorstep, and deducting the two feet drop inside the house.

His HONOUR decided that the height must be measured from the mark on the Ordnance map.

Judgment for the Company for the amount claimed.

THURSDAY, JAN. 24.

NEW RIVER COMPANY *v.* PROUT.

This was a claim made by the New River Company against *William Prout*, of Colney Hatch, builder, to recover the sum of £3 for water supplied to defendant during the building of four houses in Station Road, Colney Hatch.

Mr. DEBENHAM, solicitor, who appeared for the Company, stated that the water was taken by defendant for building purposes, without any previous notice having been given to the Company, by which, under the Act of 1852, section 40, he could have been taken before the Magistrate, and a penalty of £10 inflicted; but the Company preferred taking the present proceedings for the recovery of the money.

George Melton, foreman to the Company for the Colney Hatch district, stated that in November, 1876, and again in the course of 1877, he saw four houses in course of erection in Station Road, Colney Hatch. He saw men at work on the building take water from a cistern of the house occupied by defendant, to which house, water was supplied for domestic purposes only. The water was taken from the cistern by means of a syphon-pipe. He spoke to the foreman bricklayer on the subject, and on another occasion, in the year 1877, he saw water taken in the same way.

James Cassey, collector to the Company, stated that he first applied to defendant for £6 for water supplied to him. The charge for a £300 house was £1 10s., the four houses making £6; but on defendant stating he had taken the water from a pit on the premises, the charge was reduced one-half.

Defendant said he was the owner of a great many houses at Colney Hatch, which he had built, and had never applied for, nor required any, water from the Company. He never gave his men any orders to take water from the cistern. When water was wanted, he told his men to sink a tub on the premises, and get it from the land drain. On his own premises he had water enough to build above one hundred houses.

His HONOUR thought the Company had not made out their case, and non-suited them.

WEYMOUTH POLICE COURT.—TUESDAY, JAN. 15.
(*Before Messrs.* TALBOT, DREW, *and* MILLEDGE.)

INTIMIDATION OF GAS WORKMEN.

Samuel Symes was summoned, at the instance of the Weymouth Gas Company, "for that he wrongfully and without legal authority, and with a view to compel one John Barrett to abstain from his trade or calling as a gas stoker, did use intimidation towards the said John Barrett, and persistently follow him from place to place and watch and beset the house where the said John Barrett resides or works."

Mr. HANNE, who appeared for the prosecution, said he was happy to state that this was the first case of the kind which had come before the Bench under the Act of Parliament which authorized the present proceedings. The Magistrates were aware that an Act was passed in 1867, called the Masters and Servants Act; there was also a subsequent Act passed in 1871. But these proceedings were instituted under an Act passed in 1875, called the Conspiracy and Protection of Property Act. For some time previous to the passing of that Act, a considerable agitation had been kept up in the country, in reference to trade disputes and trade unions, and this Act was passed to meet it, a special provision being inserted for the protection of gas and water companies. The 4th section of the Act provided that where a person employed by a municipal authority, or by any company or contractor upon whom is imposed by Act of Parliament the duty, or who have otherwise assumed the duty of supplying any city, borough, town, or place, or any part thereof, with gas or water, wilfully and maliciously breaks a contract of service with that authority, or company, or contractor, knowing or having reasonable cause to believe that the probable consequences of his so doing, either alone or in combination with others, will be to deprive the inhabitants of that city, borough, town, place, or part, wholly or to a great extent of their supply of gas or water, he shall on conviction thereof by a court of summary jurisdiction, or on indictment in the manner mentioned, be liable either to pay a penalty not exceeding twenty pounds, or to be imprisoned for a term not exceeding three months, with or without hard labour. He thought it was well to let people who were in the employ of either gas or water companies know the law which bound them to their employers. He would now refer to the section under which the present charge was made, but would at once say that if Mr. George, who appeared for the defence, wished to object to the jurisdiction of the Court, the 9th section allowed him to do so, although he scarcely thought he (Mr. George) would take advantage of it.

Mr. GEORGE said he wished this case, as well as the one which was to follow, to be tried here.

Mr. HANNE said the section under which he was now proceeding was the 7th, and it was as follows:—"Every person who, with a view to compel any other person to abstain from doing or to do any act which such other person has a legal right to do, or abstain from doing, wrongfully, and without legal authority, uses violence to or intimidates such other person, or his wife or children, or injures his property, or persistently follows such other person about from place to place, or hides any tools, clothes, or other property owned or used by such other person, or deprives him of or hinders him in the use thereof, or watches or besets the house or other place where such other person resides or works, or carries on business, or happens to be, or the approach to such house or place, or follows such other person with two or more other persons in a disorderly manner in or through any street or road, shall, on conviction thereof by a court of summary jurisdiction, or on indictment as hereinafter mentioned, be liable either to pay a penalty not exceeding £20, or to be imprisoned for a term not exceeding three months, with or without hard labour." The question in this case was, Did the defendant intimidate one John Barrett with the view of compelling him from carrying out the contract which was in existence between him and the Gas Company? If the Bench thought he had so intimidated him, then he must ask them to inflict such punishment, either by fine or imprisonment, as would teach him and others they had no right to make use of such language. It appeared there were eight men in the employ of the Gas Company, who had been engaged there at work for a considerable period, but lately had been working under a sliding scale. They were paid so much per week according to the amount of gas they made. They were under a weekly hiring, and exercised their discretion by giving the Manager of the Company notice to leave. One portion of the gang left work at half-past five on the following Friday afternoon, and the other at half-past five the next morning. These men constituted the principal staff of the Gas Company, and, inasmuch as they left work on Saturday morning, there were only yardmen on the premises to whom the Manager could look for the supply of gas to the town for Saturday night and Sunday's consumption. In consequence of this Mr. Stone had to take necessary and active steps, telegraphing to some friends of his who were gas managers, as also to some persons with whom he was acquainted in Wales, for men. From various sources he had five sent; but they were inexperienced workmen, and if he had not taken the trouble, and been to the expense of £20, the town would have been in a state of utter darkness at night on the Saturday and Sunday, and the early part of the next week. Amongst other men he obtained eight from Wales, and these were under an engagement to come on Saturday morning at the time when the last men left the works. The first portion of these men came to work; but they had not been on the premises about an hour or so before some of the old hands, seeing the Manager's back turned, came into the gas-works and told the strangers, in the presence of the foreman, they were on strike. Upon hearing this the Welshmen dropped their tools and left work, and the consequence was all the trouble which had been taken by the Manager proved abortive, and he was thrown on his beam-ends, as the news was conveyed to the other four, and they never put in an appearance at all. Mr. Stone had, therefore, to get up a scratch staff, and, of course, a raw hand was not so competent to carry out the manufacture of gas as a person was who had got his hand into the work. He (Mr. Hanne) was bound to say, because it was to the credit of four men out of the eight who had been in the employ of the Gas Company, they recanted and came back, in consequence of overtures made to them. One of these was Barrett. Symes and Ryder, who were the ringleaders, as soon as they found the other four men had not stuck to their colours, beset them, calling them all kinds of foul names, even going so far as threatening to kill them. Barrett went to work on the Sunday morning at six o'clock, thus showing he very soon regretted the foolish step he had taken. When he was going home he saw the defendant and some other men standing at the bottom of Boot Lane. Naturally enough they got into conversation, the topic being about his (Barrett's) going to work. Symes then called him most foul names; and the question for the Bench to decide was whether the threats then made use of were with the view of intimidating him from carrying out his contract. If they thought so, he would ask them to inflict such a penalty as they might think fit, but not less than £5.

Barrett was then called as a witness, but declined to be sworn and give evidence, until informed by the Bench that, if he persisted in his refusal, he would be committed to Dorchester Gaol for seven days, with hard labour. Even then his evidence was given reluctantly. He said: I have worked for the Gas Company, off and on, for eight years. On Saturday morning, at half-past five, I left the Company, in consequence of my having given a week's notice to do so. I was one of the night hands. Four stokers left the works the evening previously, and three others the same time as I did. Symes was in my gang. After I left on Saturday, Mr. Stone sent to me, asking me to come back to work, and I agreed with Palmer, Ozzard, and Berry to do so on Sunday, on certain conditions. Previous to going back to work we all swore on Saturday, saying we would not go back unless we had 28s. a week. For the last three or four weeks we had been paid £1 4s. 6d. a week, the lowest scale being £1 0s. 9d. When I say "we swore," I mean the whole of the eight men who had left the works. The four of us did not agree to resume our work until Saturday night. I did not go to the other four men and tell them of our resuming work. I went to work on Sunday morning, at six o'clock, and remained there until breakfast time. The terms I went back to work on were standing wages of 24s. a week and an extra man. On my way to breakfast on Sunday morning I saw Symes and Ryder. I paid Symes a shilling which Palmer owed him. I do not know the reason why he asked me to do so. I am not aware I have stated to any one the reason why Palmer asked me to pay the shilling. I do not know I have told Mr. Stone the reason why

Palmer would not pay the shilling—whether it was because he was afraid to do so or not. I spoke to Symes first, saying, "Here's a shilling Palmer owes you." He took it, and thanked me. He then asked how it was I had gone to work—how it was I had not stuck to my colours. I told him I had spoken for all hands; but Mr. Stone said he would rather sacrifice both legs and arms than take either of the other four back again. Symes replied, "You know you agreed not to go back unless you had 28s. a week." He called me a sneaking, undermining ——, and said I should not live long if he could do it. He never mentioned my name, but included all in the remarks.

Cross-examined by Mr. GEORGE: The words which Symes used did not prevent me going back to work. His words did not frighten or intimidate me in the least from going back to work. I am as bad as the rest of the men, as I had made use of threats on Saturday to any one in the gang who went back without the others.

Re-examined by Mr. HANNE: What I mean by saying I am as bad as the others is, because I threatened. I told Mr. Stone I was compelled to be as bad as the others. If I had known it was coming to this I would not have gone back again. I do not believe Symes meant what he said. I said things on Saturday which I did not mean, and I believe he did the same. He was not drunk at the time.

By Mr. ARDEN: I went to work again after breakfast on Sunday, and worked till six o'clock at night, and am still at work. When I went home last night, I said, "I do not think I shall go out again."

Mr. GEORGE asked the Bench if they thought there was sufficient evidence to convict. He contended the case of intimidation had not been made out. These eight men agreed to strike unless they had higher wages, and when Symes met Barrett on Sunday, and found he had gone to work, they had one or two words; but the latter had told them these had not had the slightest effect on him, so as to prevent his going back to work. Was there, then, sufficient evidence to convict the defendant under this penal clause? He submitted there was not. There was no doubt words were used in the heat of the moment; but the Magistrates must be fully satisfied the defendant had so intimidated the other man as to make him really afraid to go back to work. He went back, was there now, and under these circumstances he (Mr. George) asked them to dismiss the case.

Mr. HANNE said he thought Mr. George had been endeavouring to twist the words of the Act of Parliament. The Act did not say the threats should prevent a man from going back to work, but when they were made with that view. That was the question for the Magistrates to interpret.

Mr. TALBOT, in giving the decision of the Bench, said the Magistrates had considered the case presented to them against the defendant, and were of opinion that it had been clearly proved. The defendant had been guilty of a very gross act, and they were astonished that he should have done it. It was not as though he was underpaid; the fact was he had good wages, and ought to have been satisfied. Anything like intimidation of fellow-workmen could not be tolerated. The defendant was liable to three months imprisonment and hard labour, or a fine of £20; but the Bench were disposed to reduce the penalty as much as possible, hoping that the conviction would be a warning to defendant as well as to others. They, therefore, fined him £5, or in default 21 days imprisonment.

Mr. DREW added: In this country every man is at liberty to make a bargain for his own labour, and no other man must interfere with him.

George Ryder was summoned, at the instance of the Gas Company, for using violence and intimidation towards Charles Watson on the 14th inst.

Mr. HANNE said in this case, in addition to using intimidation, actual violence was resorted to. The complainant was a perfect stranger to the town, a sailor by trade, who, being shipwrecked down Channel, made his way from Plymouth to Weymouth, and being only too anxious to get any employment whatever, he was engaged by Mr. Stone, the Manager of the Gas-Works.

Complainant: I have been for 15 years a sailor. I was shipwrecked off Falmouth, but made my way to Weymouth, where I got employment at the gas-works as a stoker. I was to have 24s. 6d. a week. I commenced work on Saturday night. On returning from breakfast yesterday morning to the gas-works I was about to walk across the new embankment, when I saw four men standing near the corner. One of them came up and said, "You are one of the —— working over there," at the same time pointing to the works. I made no answer, and he up with his fist and struck me under the chin, saying he would knock my brains out. He also said, "All you —— had better look out to-night, as you'll have very little longer to live." I am a perfect stranger to the town. I cannot identify the man who struck me out of the four.

Mr. HANNE said that being so the case must fail.

Mr. GEORGE remarked he was instructed to deny his client either struck complainant or intimidated him in the least.

Mr. HANNE wished to say, on behalf of the Gas Company, they were bound to supply the town with gas. These proceedings were not taken out of any ill-feeling towards the men, but to show the public generally, and more particularly the working men of the town, that, in justice to themselves as a company, and also to gas consumers, they were compelled to do so.

Mr. DREW (to Ryder): If you think your services are worth 28s. per week, you are perfectly justified in asking for it, but you must not interfere with a man who is ready to work for 24s. If that man has a wife and family to keep, he must be protected and not annoyed.

Defendant: I never spoke to him.

Mr. DREW: You must not interfere with men who will offer their labour at the best market; they are perfectly justified in doing so, and the Magistrates will protect them. At the same time, you have as much right to get what you can for yourself.

Mr. HANNE: I should like the Bench to give some expression as to what would be done in any future case, as I am afraid the matter has not ended.

Mr. TALBOT: The Bench wish it to be known, and to be made use of amongst your fellow-labourers, that in every other case which is brought before them of this kind they will punish as far as they possibly can, because it is an unlawful proceeding. You have as much right as others to get what you can for your labour, but not to intimidate others.

TRANSFER OF THE RAMSGATE GAS AND WATER WORKS TO THE LOCAL BOARD.—At a special meeting of the Local Board, held, in committee, on the 23rd inst., the seal was affixed to the deed of security to the Bank of England for the loan of £155,000; after which the necessary formalities connected with the transfer of the gas and water undertakings to the town were duly gone through. At a meeting of the Board of Directors of the Ramsgate Gas and Water Companies on Wednesday last, the following sums were stated as the prices at which the above undertakings are to be transferred to the Local Board:—Gas-Works, £70,052 19s.; Water-Works, £70,436 18s. 7d. The Local Board have appointed a Gas and Water Committee, consisting of seven members, who are empowered to do all acts on behalf of the Board which the Board can lawfully do under the provisions of the Ramsgate Local Board Act, 1877, except the borrowing of moneys and the making of rates.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

MEETING OF DELEGATES.

On Friday afternoon last, a meeting of delegates from Vestries and District Boards of the Metropolis was held at the offices of the National Chamber of Trade, in the Strand, to take into consideration the proposals of the Metropolitan Board of Works to assume the property of the several Water Companies, and further create a second supply, by means of a separate service. Mr. R. ATTENBOROUGH, Chairman of the Executive of the London Water Supply Committee, presided, and there were delegates present from St. Martin's-in-the-Fields, Kensington, Bethnal Green, St. James's, Westminster, Bishopsgate, Hammersmith, Southwark, Marylebone, &c.

The CHAIRMAN, in opening the proceedings, stated that the meeting had been summoned without much notice, but the fact was that there was not much time, if they were to have a *locus standi*. As delegates from Vestries (just as much so as were the members of the Metropolitan Board) they felt it necessary that there should be some control exercised from outside on the members of that Board, some of whom were Shareholders in the Water Companies, while the magnitude of the interests involved in the question should be impressed on them. On the subject of the purchase of the Companies, a short general resolution would be submitted; but they would not go into details, as there was room for a vast difference of opinion on such a large and comprehensive scheme. What was wanted, therefore, was to start on a general definite basis, and then at future meetings to decide what they were to do, to further the promotion of the scheme so far as they approved of it. He believed it would be to the advantage of the ratepayers that the whole of the property of the Water Companies should be in the hands of one public body not interested in obtaining a profit on the outlay, but chiefly interested in seeing that the consumers had a pure and wholesome supply of water at as moderate a price as could be afforded. That, he thought, was the main principle of that meeting, which he might consider as representing the ratepayers pure and simple. The St. Pancras Vestry had opposed the whole scheme, which he thought was wrong. With regard to the second scheme of a new supply, he thought that, however, was not necessary. It would be enormously expensive; it could not be done for £5,500,000. He was told that it was perfectly impossible to get water from the chalk, or, if it could be obtained, the supply would be intermittent, and would probably fail. He moved the first resolution, as follows:—"That in the opinion of this meeting it would be to the interests of the Ratepayers and Consumers that the interests in the various Water Companies became the property of the Board of Works."

Mr. E. J. WATHERSTON seconded the resolution.

Mr. BEAL said it must be understood that the Vestries were represented by the Metropolitan Board, and could not be separately heard by counsel, before a committee of the House of Commons, in opposition to the Board. He recommended the meeting to pass a resolution condemnatory of the Additional Supply Bill, and that, instead of buying up the whole of the existing Companies, the purchase should be limited to a few—such as the New River, the Kent, and the East London—so as to learn something as to the mode of proceeding. He was of opinion that the Board should purchase only a portion, as some Companies were acting in contravention of the Acts of Parliament as to giving a pure supply. Whatever was the cost of making a supply pure ought to be charged against the Companies.

Mr. LIGGINS stated that his Vestry had not had time to consider the matter. He spoke against the second scheme, as based altogether on erroneous foundations.

Mr. BONTHRON said the first scheme was quite large enough to deal with, and deprecated any discussion on the second. Even the first scheme was so crudely got up that he could only vote for affirming that it was right in principle.

Captain BERKELEY said the delegates must not be alarmed at the figures which appeared to be involved. It was a mere transfer of the undertakings from one body to another, and the ratepayers would have to find the interest, and not the capital, of the sums named.

Mr. DANIEL, in supporting the motion, said the delegates need not be frightened by the reported fabulous prices the Companies were going to ask for their rights, as that would be settled by a committee of the House of Commons.

On the question being put, there appeared to be only one dissentient; but several present refrained from voting, on the ground that their Vestries had not had time to consider the matter, so that they had no authorization.

The CHAIRMAN said he thought it would be better, under the circumstances, to adjourn the meeting for a fortnight, and it was suggested that a copy of the resolution should be forwarded to each body for consideration.

Mr. BONTHRON thought there should be an expression of opinion on the second scheme, in which observation others concurred.

After some conversation, it was agreed that another resolution upon the second scheme should be submitted, and that both resolutions should stand in abeyance, to come up at the adjourned meeting, when, having been considered in the meantime, by the different Vestries and District Boards, before whom they would be laid for consideration, they would be decided upon. The resolution was as follows:—"That the scheme set forth in the Metropolitan Water Supply Bill is premature, and that it should not be proceeded with at present." This and the previous one were left to stand over till the adjourned meeting, on Friday week, so that time would be allowed for deliberating upon them.

A vote of thanks to the Chairman brought the proceedings to a close.

The Executive London Water Supply Committee have issued a circular, addressed to the Metropolitan Vestries and District Boards, in which they state that it appeares to them that "an exceptional occasion has arisen for the united and vigilant action of the Local Governing Bodies of the Metropolis. They beg leave to point out that it is currently reported that the united claims for the purchase of the Water Companies are computed at £25,000,000, being more than double their estimated value in 1865—viz., £12,000,000; and more than four times that originally mooted before Sir James Graham's Committee in 1851—viz., £6,000,000. The demand for such a stupendous sum alone suggests the most careful attention; but, added to this, the scheme for creating a second supply for domestic purposes, and a constant high-pressure service, will, it is said, cost a further sum of £5,500,000. Thus it appears as a starting-point that the present inflated income of the Water Companies (about £1,300,000) would not be sufficient to pay the interest upon the capital outlay, and the costs of maintenance and management of the works; consequently an additional burden would be placed upon the rates, instead of the relief anticipated last year. Looking at these facts, without taking into consideration the further large individual expenditure thrown upon the Ratepayers by the 16th clause of the Metropolis Water Supply Bill, it behoves the Committee to strongly recommend united action on the part of the Local Authorities, in guarding the Ratepayers against the expenditure of so immense a sum, without most carefully and jealously watching the progress of these

measures. They would further beg leave to impress upon your Board the fact that many members of the Metropolitan Board of Works are shareholders in the Water Companies; and although they do not infer that this circumstance would influence them in the performance of their public duties, yet the Committee feel justified in adding that circumstance as another important reason for combined active vigilance."

St. Pancras Vestry.

The following is the Petition presented to the House of Commons by Sir Thomas Chambers, Q.C., on Monday the 24th, from the Vestry of St. Pancras:—

To the Honourable the Commons of the United Kingdom of Great Britain and Ireland in Parliament Assembled.

The Humble Petition of the Vestry of the Parish of St. Pancras, in the County of Middlesex, under its Common Seal, showeth—

1. That the Metropolitan Board of Works have resolved to lay before your Honourable House two Bills relating to the Supply of Water to the Metropolis, one to empower the Board to purchase the present Water Companies undertakings, and the other to empower it to give a new and additional supply of water for potable, fire-extinguishing, and other purposes.

2. That your petitioners are constituted by the Metropolis Local Management Act, 1855, and other Acts, the authority for sewerage, sanitary, paving, lighting, and other purposes in the parish aforesaid.

3. That the parish under the management of your petitioners is one of the largest in the Metropolis, containing about 25,000 inhabited houses, and a population of nearly 250,000 persons, and that the property therein is assessed at more than £1,300,000.

4. That your petitioners have strong objections to both the proposals of the Metropolitan Board of Works, believing them to be uncalled for and unnecessary, and likely to entail upon the inhabitants of this parish, in common with those of the Metropolis at large, increased pecuniary charges, without any corresponding benefit.

5. That the parish represented by your petitioners is supplied with water by the New River and West Middlesex Companies, and that your petitioners have no complaint to make of the quality or quantity of the water supplied. That the reports of Dr. Frankland, the Government Analyst, to the Local Government Board, show that the water is well purified and wholesome, and in particular his report, dated the 3rd of November, 1877, speaks of the river water supplied by the London Water Companies as "on the average equal in chemical purity to deep well water."

6. That your petitioners see no reason to anticipate that, if the Companies undertakings were acquired by the Metropolitan Board, there would be any reduction of cost to the consumers, or any essential improvement in the quantity or quality of the present supply. That the saving of expense of management, in the shape of Directors fees, &c., would be of trifling amount as compared with the total annual expenditure, and would be much more than counterbalanced by the increased expenditure in other directions, which would be sure to follow the transfer (experience showing that undertakings of this kind are economically managed by those whose profits depend upon their good management) and, moreover, the interests of the public are at present amply secured by the constant examination of the water by Government Officers, and the public audit of the Companies accounts.

7. That the debt of the Metropolitan Board is already very large, and is constantly increasing, Acts of Parliament passed in the year 1877 alone, having imposed work upon the Board, in the shape of freeing bridges, making new streets, and clearing unhealthy areas for working-class buildings, which will increase the debt by several millions.

8. That the purchase of all the Metropolitan Water undertakings would further increase the debt by an amount variously *estimated* at from 25 to 35 millions, to say nothing of the cost of the new supply, and that in the event of a new source of supply being adopted at some future time, the whole of this enormous sum would become a dead weight on the Metropolitan ratepayers.

9. For the above reasons your petitioners earnestly hope that power will not be given to the Metropolitan Board to purchase the undertakings of the Metropolitan Water Companies.

10. Your petitioners also strongly object to the scheme for a new supply of water for drinking, and for putting out fires, on the following grounds:—

11. That it is unnecessary for drinking purposes, because the water now supplied is good and wholesome, as instanced by Dr. Frankland's report before referred to—and the Royal Commissioners on Water Supply, in their report in the year 1869, after making a thorough and exhaustive investigation into the whole subject, came to the following conclusion:—

> "That there is no evidence to lead us to believe that the water now supplied by the Companies is not generally good and wholesome, and, when efficient measures are adopted for ensuring perfect filtration, water taken from the present sources will be perfectly wholesome, and of suitable quality for the supply of the Metropolis."

12. That a totally new supply is not required for the extinction of fires, inasmuch as, in the City of London and other places where hydrants have been fixed and tried, in the districts of the New River and Kent Water Companies (on the constant supply system), water can now be thrown by the simple pressure in the pipes to a height sufficient to extinguish fires in lofty buildings, and such water being supplied by the Companies free of charge.

13. That in addition to the great and needless cost (*estimated* at 5½ millions, exclusive of the cost of management) of the new system, serious inconvenience and annoyance would result to the public from the necessity of taking up every street in the Metropolis to lay down an additional series of pipes under the footways of each side of such streets, and having to enter every house for the purpose of bringing the new water into it, and this inconvenience would be felt by every householder, and, indeed, every inhabitant of London.

14. That when the new water supply is brought into houses, side by side with the existing water, it will be quite impossible to secure that every householder shall observe the distinction between the two kinds of water, so that the new water shall always be used for drinking and cooking, and for those purposes alone, and the present water for all other domestic purposes. That besides the poor and ignorant householders who cannot be expected to observe the distinction, the rich and well-to-do are so much in the hands of their servants in these matters, that they can have little or no security that the distinction will be always observed in their houses, and, if it be not, the new supply will be practically valueless, and the money spent on it will be thrown away.

15. Your petitioners believe that the generality of London householders are quite unaware of what it is intended to impose upon them, and of the increased rates and the inconvenience and difficulties which will follow, and that, if they were aware of it, there would be a "loud outcry against the measures."

Your petitioners, therefore, humbly pray your Honourable House that the Bills of the Metropolitan Board of Works in relation to the Water Supply of the Metropolis, may not pass into law, and that your petitioners may be heard by themselves, and by their counsel, agents, and witnesses, before any Committee to which the said Bills may be referred, in support of the allegations of this petition, and against the said Bills, and that your petitioners may have such other relief as to your Honourable House may seem meet.

And your petitioners will ever pray, &c.

Strand District Board.—A communication has been addressed by this Board to the Metropolitan Board, intimating that "while approving generally of the policy of the Metropolitan Board in its desire to obtain the necessary power to acquire the interests of the Water Companies of the Metropolis, they condemn the project of the Engineers, which contemplates laying down a double water supply at an enormous addition to the Metropolitan rates. That this Board consider that no further action beyond the purchase of the Water Companies should be taken by the Metropolitan Board of Works until they have become the authority for the supply of water to the Metropolis, and have found that the large powers now existing in the various Acts of Parliament, for the purification of the river and the improvement of the supply, are insufficient, and that a double supply is urgently required."

Major Bolton reports that the state of the water in the Thames and Lea was generally turbid and discoloured during the month of December last. Of the Companies drawing their supplies from the Thames, the West Middlesex, East London, Chelsea, and Lambeth have sufficient storeage capacity and impounding reservoirs to avoid taking in water when floods prevail, the Southwark and Vauxhall, and Grand Junction Companies, on the other hand, are not so circumstanced, but have acquired land for the construction of suitable storeage reservoirs and other works at Hampton. The water in the River Thames at Hampton, Molesey, and Sunbury (where the intakes of the West Middlesex, Grand Junction, Southwark and Vauxhall, Lambeth, Chelsea, and East London Companies are situated) was turbid on the 1st of December, but improved in clearness about the 6th; it then became worse, and on the 10th was very turbid; from that date it improved, and remained good up to the 29th; after which it again became coloured, and remained in a turbid condition until the end of the month. The highest flood state of the river at Hampton during the month was 2 feet 8 inches above summer level, and the lowest one inch above summer level.

MANCHESTER WATER SUPPLY.

The Thirlmere Scheme.

On Monday, Jan. 21, at a Meeting in London of the National Health Society, held under the presidency of Mr. Ernest Hart, a deputation, headed by Mr. Somervell, attended from the Thirlmere Defence Committee, to seek the aid of the Society in opposing the scheme, which proposes to enable the Corporation of Manchester to purchase the valley of Thirlmere, with its surrounding mountain slopes, in the whole 11,000 acres, to construct a reservoir on the site of the present lake, capable of affording a constant supply of 50 million gallons of water daily. It was stated that the grounds of the opposition were that the natural beauties of the lake scenery are in themselves as important medicinal agents to the overworked as pure water itself, that more suitable sources exist, and that, even if they did not, the quantity proposed to be taken is in excess of the actual requirement. The city of Manchester, on the security of whose rates the requisite capital is to be borrowed, is under statutory obligations to supply a surrounding population of 800,000 persons. If population increases as of late, the numbers may possibly amount to a million fifteen years hence. The 800,000 are now abundantly provided for by the distribution of about 17 million gallons or 21 gallons a head per day. Yet the Corporation, having already this supply, propose to go into Cumberland, to a spot 100 miles distant, and there take possession of a further supply, which will give them 75 million gallons daily. It was further alleged that there existed vast elevated moorlands, drained by the River Lune, and extending from Lancaster to Tebay, on the Carlisle Railway, which region is practically unoccupied for such purposes; there are copious sources of underground supply, and the rainfall is above that of England generally. The Thirlmere Committee proposed asking the Home Secretary to receive a deputation on the subject.

The Chairman, in answer to questions, said it was proposed to obtain an inquiry into the whole question of Lancashire water supply by a Royal Commission or Select Committee of the House of Commons, where others beside the owners of the lands at Thirlmere would have a *locus standi*, instead of permitting a powerful Corporation to carry their Bill through a private Committee, before which no representation of what would be known as public interests could be made. He characterized the scheme as a merely financial one.

After some discussion, a resolution was passed binding the Society to assist the Thirlmere Committee in obtaining a full parliamentary inquiry.

On Thursday, Jan. 24, a deputation from the Corporation of the City of Manchester had an interview with the Right Hon. G. Sclater-Booth, at the Local Government Board, with reference to the Bill now before Parliament, promoted by the Corporation, for securing an increased supply of water from Lake Thirlmere.

The deputation consisted of Sir Thomas Bazley, M.P., Mr. Hugh Birley, M.P., Mr. Hibbert, M.P., Mr. Jacob Bright, M.P., Mr. Hardcastle, M.P., Mr. Isaac Fletcher, M.P., Mr. Benjamin Whitworth, M.P., the Mayor (Alderman Grundy), Alderman Grave, Alderman Patteson, Alderman Bennett, Mr. George Booth, Mr. Bateman, C.E., Mr Hill, C.E., Mr. Talbot (Deputy Town Clerk), and Mr. Berry (Water-Works Superintendent).

The President announced that Mr. Cross, the Home Secretary, was unable to be present, owing to unavoidable engagements elsewhere.

Mr. Birley, M.P., introduced the deputation, and, in doing so, said the principal object was to obtain the sanction and support of the Government to the second reading of the Bill, so that it might not be thrown out on side issues or insufficient reasons in the House of Commons, but that it might go free and untrammelled before a Select Committee for the most thorough and complete examination. The one thing they had to fear and deal with was the sentimental question, the powerful effect of which was likely to be considerable on those Members inside and outside the House unacquainted with the matter. There might be an objection made that the scheme was unnecessary, that Manchester was able to supply herself with water without having recourse to Thirlmere Lake; while the other objection was that the Manchester Corporation were in the habit of providing both manufacturers and private houses beyond the limits of the borough with water. If that objection existed at all it ought to be removed as speedily as possible. Those persons who lived in the suburbs were practically themselves citizens of Manchester, and it was now becoming impossible to supply those parts with water, except by artificial means; but neither the Local Boards throughout the country nor the Local Government Board would desire that the supply of water by artificial means should be thrown upon a single board; the cost would be too enormous, and the people of Manchester were perfectly satisfied to take over

present arrangements, and to carry them out perfectly. The population was growing enormously, and the Corporation were anxious, giving heed—looking ahead—to what might be wanted in the course of ten years.

The MAYOR of MANCHESTER (Alderman Grundy) observed that they sought that interview to state the position they, as a Corporation, stood in with reference to the projected Thirlmere water scheme. The point to which they wished to direct attention was an extremely simple one. In Manchester the Corporation had had very extensive water-works, and they had had credit given to them throughout the country for the foresight they had shown in the provision of those water-works; and they were such as, generally speaking, from the tone of the public upon the engineering skill displayed, reflected credit upon the Corporation for the good services done. But it was now between 30 and 40 years since those water-works were projected, and from that time not only had the population of the city greatly increased, but large claims had been made upon them from outside districts, because many of those districts were under local boards, and were not able, either financially or from a geographical point of view, to provide any water-works of their own. Therefore, the claims of the surrounding districts, which Manchester had had to meet, were very great. To show the extent to which those demands had grown upon them, he stated that the yearly increase of consumption amounted to 750 million gallons on the average each year. That pointed to the conclusion that their present supply would very speedily be exhausted, as they had only a certain circumscribed area of rainfall, and stated pretty accurately how long present means would last. They were told by their engineers, and confirmed by various experiments, that about six or seven years from the present time would see them at the end of their tether as regarded their supply. It would be, therefore, understood that the Corporation, as representing a large community, feeling that they had the supply of water to provide for no less than 800,000 individuals—the city proper and surrounding districts—naturally felt that a great amount of responsibility attached to them. They tried to forecast the wants of the community, but in water-works it was particularly incumbent on them to look ahead, because such things could not be accomplished in a few days, especially works of that extent, or of any extent, for the wants of such a community. It was estimated that no water could be available from the new source under ten years from the commencement of the alterations. The demand would have overtaken their supply before they could utilize the new source. They did not pretend to say that they were in want at the present moment, but they maintained that they would want before they could obtain supplies from the present source. With reference to the scheme itself, they knew the cost and every detail, having had Bills before passing through Parliament. They had prepared in the past, at great cost, plans, specifications, calculations, and everything of an elaborate kind, to enable them to go before a parliamentary committee to make a case clear, and they were not ignorant of what the present scheme involved. There was now on the books of the House a motion to be made by Mr. Howard, of Cumberland, which might be characterized as an insidious motion, and one which undoubtedly aimed at the Thirlmere scheme, although the name of Thirlmere did not occur in the notice. They knew that it aimed at their proposal, and they wished to represent to the Government that they had prepared themselves, at great outlay, to go before the Committee of the House, where they were prepared to enter upon the merits of the scheme, and meet every possible objection that could be urged against them. They ventured to say that those of the Thirlmere Defence Association, who were opposing the scheme, were not prepared to meet the scheme on its merits. He asked, what possible evidence could be brought before the proper tribunal that would be valuable evidence respecting the supply of water to such a town? Who could get up the evidence against such a scheme? It would be useless; and they thought that if the Government lent its sanction to such a proposal it would take upon itself great responsibilities. Was the Government ready to undertake the supply of all the populous places in the North with water? Was it proposed to destroy the zeal of the Corporation in the matter? On the contrary, was it not the object of the Government to encourage them? They asked the President to allow them to use his influence and that of the Government in saying that an important question like that was not to be disposed of by a side wind such as Mr. Howard's motion was. Representing an important community, they knew what they were about; they had obtained the best scientific knowledge the country could provide, and they asked to be heard what they had to say on the subject.

Mr. BATEMAN, C.E., said that to a great extent he was responsible for the Manchester Corporation being now before Parliament, because, as their adviser for 30 or 40 years, and the engineer of the works already carried out, he felt it his duty from time to time to look into their means of supply, and he found that in 1855 the quantity of water taken into the town of Manchester and the district the Corporation had had to supply when they purchased the old Manchester and Salford Water-Works was 8 million gallons per day; but now, 20 years later on, it was 18 million gallons per day, so that the consumption had increased 10 million gallons per day in the course of about 20 years. Seven hundred and fifty thousand gallons per day was some time since the increase, but the average of the last two years was 1,200,000 gallons per day. If the prosperity of Manchester was to continue, they would require at the least 1 million per day more. It was going on at that rate some years ago, when he brought the subject before the Water Committee of the Corporation; but by great economy at the outset, by house-to-house visitation, and other means, the waste was reduced, and had not been 1 million gallons a day since that time, but only 750,000 gallons. He believed, however, that no further reduction could take place by economizing supplies. It must be considered that the inhabitants of Manchester were a flower-growing or garden-loving people, who carried on their business within the city and lived on the outskirts. Those who lived in the suburbs were quite as much residents of Manchester as those carrying on business in the town itself. But to gratify their tastes, which were of a horticultural character, they used a considerable quantity of water; so that the wants of the inhabitants, independent of their domestic and trade wants, were greater than those of most towns. The present consumption was about 18 million gallons per day, but in years of extreme seasons—of cold or drough, or intense heat or cold—the consumption would run to 21 millions per diem. But if the yearly increase went on at the rate of 1 million gallons per day, in six years they would come to the full extent of the quantity of water they had to supply. The result would be almost a water famine, so that without the new supply the prosperity of the town would be crippled, and the manufactories now existing could not go on. With regard to other districts from which water could be obtained, it was found that almost every district where water was available was appropriated already. When, forty years ago, he recommended the Corporation to go to the Valley of Coverdale for water, that was because it was so situated that additional supplies could be brought from the south to the north. Since then the prosperity of the public had not been confined to Manchester, but had extended to other towns, which had appropriated to themselves other sites which he thought, thirty years ago, the Corporation might have looked to go to. On imperial and national grounds, in his opinion—and others who had considered the subject felt the same—no near gathering-ground ought to be taken by any large community which could afford to go to a longer distance. Liverpool went to the Preston and Bolton and other hills, which they completely sucked, and the result was that Preston, Blackburn, and other places had been obliged to go to much greater distances than they would if they had been left alone to that district for their supply. Only last year Blackburn went up to the sources of the Hodder to get its supplies, and a few years ago Preston had gone to the same district; and so it had happened that almost every near place had been appropriated, or ought to be, and would be required by the populations who lie near to them. Under such circumstances, when a large quantity of water had to be obtained for Manchester, with a community of 800,000 persons within their limits of supply, they felt that they must go that distance to which no other town could go. Besides, no other district would yield the quantity of water which they would require, and if they had to go, as they must, for the great quantity of water they required, they must expend a large sum of money, and they ought to make provision for a great many years to come, and as the nearest place for that supply was Thirlmere Lake, there, by his advice, they had gone. It was proposed to raise the water some 50 feet, and not drive it down from its present level; and, inasmuch as the site would yield 50 million gallons of water per day to the public, in addition to the compensation which would have to be given to the streams from which the water was taken, the variation in the level of the lake between high and low water would be 8 or 9 feet, and if they drew 20 million gallons per day—which the present generation would not see, and would not, perhaps, be alive to see—the variation in the surface would not be as great as the variation in the surface was now; so that the broad margin of mud which the sentimental opponents of the scheme talked about, really existed only in their imaginations, or the misrepresentation of those who did not understand the question. It would not be until 40 or 50 years had elapsed that the whole quantity of water might be expected to be obtained, and then any drought must last some 135 days, before the water could be drawn down to the present level of the ake. The average rainfall during 10 months of last year was 98 inches, and the water at present ran away absolutely useless. There were few manufactories there, and those that did exist would be much benefited by having a larger supply than they now had, and the damage from floods would be lessened. There was only one resident on the lake, Mr Leathes, of Dayhead Hall, and that residence had been purchased by the Corporation. Instead of being looked upon, as the Corporation should be, as the preservers of the district, they were regarded as the destroyers, because, in consequence of their desire to keep the water of the lake as pure as possible, they, as the possessors of the house, would become the owners of all the drainage round—the lords of the manor—so that the water of the lake would not be polluted but kept in its pristine state, and the operations of the Corporation ought to be hailed with satisfaction rather than with apprehension. The area of the lake would be greatly increased; and speaking as an enthusiastic admirer of fine scenery, although small lakes and high mountains might be very grand and terrible, yet as a matter of beauty everything ought to be in harmony, and a small lake in the midst of high mountains was not so beautiful as if it were in greater conformity with the scenery around. Therefore Thirlmere Lake being enlarged would be more in harmony with the mountain peaks that enclosed it. At present only the upper and nearest part of the lake was seen by one tourist in ten thousand. The lower part was private property—there was no road to it. The Corporation proposed to make a road all round the lake, and to maintain it at their own expense, to which they would give perfect freedom to all tourists. The town of Keswick was the only one between Thirlmere and Manchester interested in the question; 650 out of 700 ratepayers of Keswick had petitioned in favour of the Bill, showing they fully appreciate the benefits to be conferred by the Corporation on that district, and it was thought that, so far from its being an injury, it would be a benefit to the country. The work from the lake would commence by a tunnel between two and three miles long; it would then enter into a "cut and cover;" it would be cut in the solid, having an archway, and the tunnel would be covered over, so that, being invisible, no one would know even where the aqueduct was. The work of making the tunnel would hardly be seen, and every care taken to keep it from view. It would pass by Grasmere, Ambleside, Windermere, Kendal, Preston, Chorley, Blackburn, Horwich, Bolton, and to Manchester, to which latter town it would be conveyed by iron pipes to the present service pipes of the Corporation. It was hoped that such an illusory idea as that of connecting all the different towns in Lancashire and Yorkshire in one common object for getting a supply of water would not be permitted by the good sense of the House of Commons. He trusted, therefore, that Mr. Howard's motion would not be carried into effect, as it would only defer the object they had in view for years.

The PRESIDENT: I think Mr. Birley spoke of the fallacy that pervaded the public mind on the hypothesis that Manchester was about to provide water for a greatly extended district, and he also said that the natural annual increased requirements of the districts were from 750,000 gallons a day. I want to know whether the plan of the Corporation is greatly to extend the existing area over which they now have to distribute water?

The MAYOR: We have not sought to supply any other district.

The PRESIDENT: I have heard with great interest Mr. Bateman's admirable exposition of the plan which he has prepared for the great and important community which you represent, and it hardly required even so much as he said to interest me in what, of course, is a most important proposal. You have made two requests—one that the Government will support the second reading of your Bill; the other is that they will oppose the motion of Mr. Howard. At all events you have given me your reasons for wishing the aid of the Government in getting the attention of Parliament and of the Parliamentary Committee to the details of your scheme. For that you have very strong grounds to trust to the universal practice of the House not to baulk in its inception anything so large and important as this is. Whatever view the House may take it is not for me to say. I shall report to the Government all you have stated to me here, and consult, no doubt, the Chancellor of the Exchequer, who will communicate what course he will take on the two questions, both of which will shortly come on, on Mr. Howard's motion and the second reading of your Bill; and I can only promise for my own part that I will lay before him what you have stated, and urge the great importance of the subject of looking upon it, in the Government point of view, in a dispassionate manner. You have not said when the second reading of this Bill is fixed for?

The MAYOR: The 6th of February, it is understood.

The PRESIDENT: Then, at any rate, Mr. Howard's motion is pretty certain to come on first?

The MAYOR: Yes.

The PRESIDENT: The two questions are not identical; I wish to caution you upon that, and I say that the Government may take one course upon the one and another course upon the other; but, however that may be, I shall have great pleasure in seeing the Chancellor of the Exchequer upon it, and shall tell him all you have said.

The Deputation having thanked the President for his courtesy, retired.

FAVERSHAM WATER COMPANY.—The Directors of this Company recommend the declaration of a general dividend this year of 7 per cent.

LEEK GAS SUPPLY.

A Meeting of the Leek Improvement Commissioners was held on the 22nd inst.—Mr. J. Brough in the chair.

Mr. Allen (the Law Clerk) read a communication from the Local Government Board, in which they stated that they had no power to authorize the Commissioners to enter into a contract for gas-works, to defray the cost of which a loan would be required. The Board pointed out that the Commissioners had at present exhausted their borrowing powers for gas purposes, and that before any further loan for such purposes could be obtained, fresh borrowing powers were required from Parliament. The Board were not in a position to say whether the Provisional Order to confirm such power on the Commissioners as that for which application had been made, would be confirmed by Parliament if issued. The Board regretted any inconvenience to which the Commissioners might be exposed in the matter, but they were of opinion that it might have been prevented had the suggestion made in a former letter been acted upon.

On this untoward state of things the *Staffordshire Sentinel* remarks:—

"For once the usually wide-awake Leek Commissioners seem to have been caught napping. They want to borrow money for a new gasholder; but their borrowing powers are exhausted, and they have not given notice of application to Parliament for an extension of their borrowing limits. The result is that Leek, so far as its gas provision is concerned, is likely to find itself next winter in the position of a promising youth who has outgrown his clothes. It is a lucky and an unlucky dilemma. Lucky, because the increased demand for gas proves the increasing importance of the town, and because, the gas-works being public property, every additional 1000 feet consumed represents a profit of which the ratepayers have the whole advantage. On the other hand, it is unlucky because it involves the unpleasant possibility that when the now lengthening days grow short again, the clergy of all denominations may find their 'thirdly,' abruptly cut short for want of light on the subject, while for the same reason a rule *nisi* will pass for a temporary divorce between buyers and sellers, involuntarily short time will prevail in the busy mills, and those who love 'fourpenny' not wisely but too well will not be able to find a lamp-post to embrace. The only gainers will be lovers, thieves, and shopmen. The latter will rejoice in a universal early-closing movement; while the two former, who, for similar reasons, love darkness rather than light, will, under the friendly shade, forge the fetters of Hymen and of the policeman. The Commissioners do not relish the prospect, and, like a dutiful child in trouble going to his father, have applied to the Local Government Board to help them. Like too many fathers, the said Board has proved itself only a Job's comforter. It adopts the 'I told you so' style, which is the most irritating of all possible forms of consolation to anybody who has got himself into a mess. 'The Board regretted any inconvenience to which the Commissioners might be exposed in the matter'—who has not heard such expressions of regret from a candid friend?—'but they were of opinion that it might have been prevented had the suggestion made in a former letter been acted upon.' Of course. There never was a difficulty which might not have been prevented if something had been done which was not done. But the Board hold out a glimmer of light to the Commissioners in their threatened darkness. The hope it offers is about as vague as that which Burns gives 'the Deil'—'Ye aiblins might, I dinna ken.' Whether a Provisional Order, if issued, would be confirmed by Parliament, they 'were not in a position to say.' There were kings before Agamemnon, and after him for that matter. Let the Leek Commissioners take heart of grace, or grease. Time was when the world knew not gas; the time will be when it will know it no more. Why not fall back on tallow or ile? Better still, why not venture forth, like Columbus, in search of a new world, in quest of the 'light of coming days?' We suggest the electric light. It might be tried tentatively in the first-class waiting-rooms at the railway station, where, as we can aver from painful experience, light is now, at least on Sunday nights, too often 'conspicuous by its absence.' There are compensations in everything, and if all these resources fail the moorland town will still have a glorious opportunity of verifying the adage which promises health, wealth, and wisdom to those who go 'early to bed.'"

DYNAMO-ELECTRIC APPARATUS.

At the Meeting of the Institution of Civil Engineers, on Tuesday, the 22nd inst.—Mr. Bateman, President, in the chair—the paper read was on "Some Recent Improvements in Dynamo-Electric Apparatus," by Dr. Higgs, Assoc. Inst. C.E., and Mr. Brittle, Assoc. Inst. C.E.

In a brief review of the rise and progress of this branch of electricity, the authors stated that the practical application of Faraday's important addition to electrical knowledge appeared in the first magneto-electric machine, constructed in 1833 by Pixii, and subsequently improved by Saxton and Clarke. The use of machines of large size, driven at high speed, was suggested by Professor Nollet. In 1854, Dr. Siemens, of Berlin, introduced the Siemens armature. The principle of accumulation by successive action, by combining two cylindrical armature machines, was due to Mr. Wilde. All these magneto-electric machines were disadvantageous in use, because their effect did not increase with their dimensions. In 1867, Dr. Siemens patented a machine to obviate rapid reversals. The step from magneto-electric to dynamo-electric machines originated with Dr. Werner Siemens, Sir Charles Wheatstone, and Mr. S. A. Varley, the priority falling to the former. In the Seimens machine a peculiar method of winding the wire on the armature, devised by Mr. Von Hefner Alteneck, was employed. In the Gramme machine, a principle was adopted which had been described by Pacinotti in 1863, of whose apparatus the present Gramme machine was a modification.

A description was then given of the latest construction of Siemens Dynamo-Electric Machine and Electric Lamp, the latter devised specially for lighthouse illumination, and similar lamps were about to be supplied for the Lizard Lighthouse. The dimensions, weights, number of revolutions made by the cylinder, light equivalent in normal candles, and horse power required for driving, were, for three sizes of machines:—

Dimensions in Inches.			Weight in Pounds.	Revolutions of Cylinder.	Candles Light.	Horse Power.
Length.	Width.	Height.				
25	21	8·8	298	1100	1,000	1½ to 2
29	26	9·5	419	850	4,000	3 to 3½
44	28·3	12·6	1279	480	14,800	9 to 10

In the application to lighting purposes, the improvements in the present dynamo machines were obvious. The magneto-electric machines first employed in lighthouse illumination, as pointed out by Dr. Tyndall, bore a cost of 10 to 1 as compared with the latest dynamo machine; while the cubic spaces occupied were as 25 to 1, and the weights as 13·7 to 1, the total light power produced for the condensed beam of light being as about 1 to 5. Thus, with a cost 10 times, with a weight 14 times, and a volume 25 times that of the latest construction, the old machine produced one-fifth of the light, with an expenditure of practically the same driving power.

The results of experiments with the electric light apparatus by Captain Abney, R.E., at Fort Monkton, in July, 1875, were given; but a more instructive series were contained in the Trinity House Report on the "Comparative Trials of Electric Lights at the South Foreland," from August, 1876, to July, 1877.*

An important factor in the light efficiency of a given machine was the resistance of the circuit leading to the lamps. Experiment indicated that, to obtain a maximum of light, the resistance of the conducting wires should be proportioned to that of the machine. In the use of dynamo or magneto-electric machines, the chances of stoppages had been quoted as a serious disadvantage; but these chances had been so reduced as not to exceed those arising with machines generally. The Trinity House Report stated that "the No. 68 Siemens machine worked well from the 7th of March to the 7th of April, without any necessity for a stoppage. On the 11th of March the commutator plates and brushes were adjusted; on the 19th the brushes were renewed; on the 28th the commutator plates and brushes were again adjusted; and on the 6th of April the commutator plates and brushes were renewed." The duration of the light, owing to required renewal of carbons, was limited to a certain number of hours, dependent on the size of the carbons and the machine employed.

Much excitement had been evinced as to the probable competition between gas and electricity, as sources of light-power. Although, under certain circumstances, these two agents undoubtedly came into competition, they had two separate fields. Hitherto gas had been employed for lighting spaces of both large and small dimensions, because a better source of light for large spaces had not been procurable with economy. But for lighting large spaces not subdivided by opaque objects or screens, it was a want of economy to employ gas. Assuming light power proportional to horse power expended, 100 horse power would give 150,000 candles light; distributed from three points, the cost would not be more than £1 2s. 6d. per hour, each light-centre giving an illumination which would enable small print to be read at a distance of a quarter of a mile from the light. A burner giving the light of 20 candles consumed 6 cubic feet of gas per hour, which might be manufactured at a cost of 2s. per 1000 cubic feet. This gave 7500 burners light only, and 45,000 cubic feet of gas, at a cost of £4 5s. per hour, a ratio of 4 to 1 in favour of electric lighting. The economical ratios differed greatly, being dependent chiefly upon the price of gas and of the motor power employed. For large spaces the cost of electric lighting was about one-fourth, or even one-fifth that of gas lighting, when steam had been used as power, and wear and tear were reckoned. With a gas-engine as motor, the ratio had only been as 1 to 3, the greatest economy having been with a turbine as a motor. At M. Dieu's workshops at Davours, the cost per hour for gas was 2s. 0·632d. against 1s. 7·2d. for electric lighting. M. Ducommun found, taking into account wear and tear and interest, that gas cost 2·25 times more than the electric light, which ratio was increased to 7·15 when wear and tear and interest were left out of consideration. At Messrs. Siemens Brothers Telegraph Works the economy was as 2 to 1 in favour of electric lighting. If, however, the ratio of light intensities were adopted as the ratio of efficiency, the advantage would be considerably higher (20 to 1) in favour of electric lighting. It might be laid down, as proved by experience, that for lighting large spaces, not too much subdivided, the advantage was greatly in favour of the electric light; but that where numerous light-centres of small intensity were required, or where the space was much subdivided, the advantage was in favour of gas. This advantage would cease when a practical method of subdividing the electric light was obtained.

The limit set by distance to the transmission of power, by means at present adopted, had been comparatively narrow. Hydraulic power had been the most adaptable, with, however, several important disadvantages. Although electricity as a means of transmission was also limited by the distance to be traversed, the limit was in this case much more extensible, and under favourable instances practically disappeared. For the transmission of power, say from a steam or water motor initially, the following system was adopted:—First, a strap or belt from the motor was carried to the pully of the driving dynamo-electric machine which generated the current. By leading-wires of the required length, the electrical current generated in the first machine was conveyed to the terminals of a second and precisely similar machine. Thus the first machine generated the current which was utilized in imparting motion to the second machine. The greatest work was yielded by the second machine when the strength of the current given by the first machine or source had been reduced to one-half, by the induced current from the second machine. Supposing two equal machines arranged for the transmission of power, the amount of work reclaimable from the second machine would be 50 per cent. of that employed upon the first, and the number of revolutions of the armature of the second machine, corresponding to the maximum of work reclaimed, would be half the number made by the first. Experiments also proved that the loss of efficiency was proportional to the added resistance.

The employment of the currents of magneto-electric machines for electrotyping and electroplating had long superseded the voltaic current. It was, however, only on a large scale that the current from a dynamo machine could be used with advantage. For small electro separations, or depositions, magneto-electric machines had been constructed. For the deposition of large quantities of metal, where by changing baths in succession little change was made in the total circuit resistance, the dynamo machine gave much greater economy. With one of these machines, and a proper succession of vats, as much as 3 tons of copper had been deposited daily.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The political events of the past few days have again reacted in a prejudicial manner upon all commercial enterprises, and it would seem to be quite certain that there will be no appreciable expansion of any of the leading branches of trade until the present uncertainty and liability to war are removed. In all directions would-be purchasers are afraid to complete transactions in the present state of affairs, and producers hardly know what to do to be right. Up to now the principal pig-iron smelters have continued to maintain a steady output, especially of good foundry pigs, which are to a great extent being delivered in execution of contracts which have been entered into since the commencement of the new year. In the open market here, very few parcels have this week changed hands, and the local agents of most of the Yorkshire and Derbyshire producers are complaining very bitterly of the minimized amount of business which is being done. The reductions of wages, to which I have made reference at some length on former occasions, have for the most part been carried out in a pacific manner, the men being apparently convinced, at last, that the depression is such that they must perforce fall in with their employers views, if they would have any employment at all. The ironworkers, as a

* These tables were published in the Journal, Dec. 11, 1877.

class, are very badly off, and the amount of distress amongst their families here is so great that all the energies and resources of a large and influential town's committee are being taxed to the utmost to provide for them. This cheerless state of affairs is not merely owing to the current depression of trade, but is, as has been fittingly remarked by Mr. George Wilson, Managing Director of Charles Cammell and Co., to a great extent brought about by the constantly increasing way in which steel of various kinds is being used instead of iron. There is, therefore, but a poor outlook for many of the puddlers and others, but, on the whole, the abolition of puddling would not be a matter for great regret, inasmuch as it involves labour which is admittedly of the most severe and unintellectual description. In finished iron there has been no movement whatever this week.

There is a considerable demand for house coal of all qualities, both on account of the local and metropolitan markets. Steam coal is neglected, and will in the usual course remain very quiet until the reopening of the shipping season to the Baltic and other northern ports. Prices are quiet all round, owing to the very severe competition that exists.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Business continues extremely dull both in the iron and coal trades of this district, and there is so much uncertainty with regard to the future, that consumers will only buy for their hand-to-mouth requirements, and these are extremely small, owing to the general depression in all branches of trade.

For the better classes of coal the market continues fairly steady, but the inferior descriptions of fuel, which are difficult to move, and generally a drug, are weak in price, the underselling amongst needy holders, who are compelled to seek for orders in the open market, causing a general want of firmness. House-fire classes of fuel, which meet with a moderate demand, about equal to the present production, are quoted at the pit mouth at about 10s. to 11s. per ton for best Wigan Arley, 8s. to 9s. for common ditto, about 8s. 6d. for Pemberton four-feet, and 6s. 6d. to 7s. 6d. per ton for common round coal, suitable for house-fire purposes. Common coal, for forge and steam purposes, which meets with but a very limited inquiry, is quoted at from 5s. 6d. to 6s. 6d. per ton, and burgy, which is also very quiet, is offered at from 4s. 3d. to 5s. 6d. per ton at the pit, according to quality. There is a slight improvement in slack, which does not appear to be quite so much pushed in the market, and good ordinary sorts are quoted at from 3s. to 4s. per ton at the pit.

There is still very little doing in the shipping trade, with a keen competition for any orders in the market, especially at the high level, Liverpool, where common coal is offered at 6s. 6d. and 6s. 9d. per ton.

There is yet a great deal of underselling in the iron trade, and local producers of pig iron who adhere to late rates are securing very few new orders at present. Holders of outside brands, although they are offering at very low figures, are also doing very little business in this district. The finished iron trade continues very depressed, and for delivery into the Manchester district the quotations remain at £6 3s. 6d. to £6 5s. for Middlesbrough bars, £6 5s. to £6 7s. 6d. for Lancashire, £6 7s. 6d. to £6 10s. for North Staffordshire, £4 5s. to £4 6s. 6d. for Middlesbrough puddled bars, and £4 17s. 6d. for North Staffordshire ditto.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

Last week was a very anxious one in the North of England. Everything seemed unsettled, and merchants hardly knew what to do. Under these circumstances, very little trade was done, except in best gas coals. Several more contracts have been made for best gas coals to be delivered over the year, one or two of them were for large gas companies, and were heavy. The prices arranged for were, as near as could be, 7s. 6d. per ton, less 2½. This seems to be the ruling quotation upon which all the contracts for best gas coals were made. Best gas, for immediate shipment, in some instances has been sold at 8s. per ton, less 2½. Several cargoes of gas coals have been shipped to the Italian ports. The Irish demand is very well sustained, and three or four more cargoes have been sent to Boston, U.S. The following is the figure for the latter:—8s. per ton, less 2½, f.o.b.; 5s. 6d. freight, 3s. 6d. duty charged by the American Government, and the ordinary port charges upon cargoes landed at Boston. The inquiry for second-class gas coals is highly irregular, and much of it is merely local. Notwithstanding the continuance of the strike in the Northumberland steam coal district, the shipments of Durham coals have been less during January than in the previous month of December. The inquiry for house coals has been improved by the sudden appearance of intensely cold winter weather. Rates for very best are 12s. 6d.; second best, 11s.; inferior, 9s. 6d. to 10s., less 2½. The dispute in the Northumberland steam coal trade is likely to be brought to a termination by the men agreeing to work by a sliding scale, the same as in Durham.

The coasting business never was more dull in mid-winter than it is at present. Coasting steamers in the market are quite in excess of the demand. About 4s. 1½d. is the rate paid steamers to take coal to London, and 5s. 9d. to small sailing ships of between 5 and 10 keels, to be discharged at the wharves in London river. Most of the small ships that reach the northern coal ports have been freighted by the gas companies previously, and therefore there is little business done in chartering vessels in the open market. Gas coals are taken by steamers to some of the larger ports in Ireland at a somewhat low rate of freight. Coals are shipped to South America but in very moderate quantities. The East India trade is opening out better for steamers, but no one can have any conception what the Mediterranean and Black Sea trades will be over the next three months. If there is peace, there will be a very brisk demand for iron steam tonnage. If our country were involved in war, shipping would be thrown into inextricable confusion.

A good deal of pig iron is being shipped abroad. Russia is building 100 torpedo boats, to be propelled by steam, and agents have been engaging men on the Tyne to go out to St. Petersburg to be employed in making these war vessels. The fire-brick, cement, and other industries are dull. Goods are being shipped to South America and Japan, but the general shipping business is exceptionally flat. The iron trade is without change.

Numbers of pitmen, seamen, and other north country workpeople are out of employment, and many have been so for several weeks. They are literally starving. There has been no such continued depression of trade in the north country for the past 20 years.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Since the gas supply of the town of Alloa was taken over by the Municipal Authorities, the Gas Committee of the Police Commission have been arranging with Mr. George Boyd, the Manager of the Gas-Works, to prepare a report upon the state of the supply-mains throughout the town, and other plant, chiefly with the view of ensuring an equalization of the pressure and economical distribution of the gas. Mr. Boyd has, after a very complete survey, made a report recommending the expenditure of about £900, and it is probable that estimates for the proposed work will be taken forthwith.

On the recommendation of their Lighting Committee, the Police Commissioners of Inverness have resolved to erect a large number of new gas-lamps, and the Gas and Water Committee are moving with the view of erecting a new gasholder, and, therefore, secure a larger amount of storeage capacity, as recommended some time ago in the report prepared by Mr. Smith, of Aberdeen.

The village of Newport, an important residential suburb of Dundee on, the south side of the Tay, is about to set up as many as 36 new street-lamps for lighting up its darkness. It is stated that they are the result of a private subscription recently made amongst the residents. An attempt was made to raise the necessary funds by means of a voluntary assessment, but that did not succeed. The lighting of the lamps hitherto in use has been provided for by a levy, made upon every consumer by the Gas Company, to the extent of 3d. per 1000 cubic feet, which may be regarded as a sort of equitable assessment, inasmuch as it bears very lightly on the small householder, and is not heavy on the large ones, while it costs, or may be said to cost, nothing for collection. By-and-by, however, it is very probable that the people within the area of the gas supply will require to go in for the adoption of the Police Act.

Dr. Wallace's report on the illuminating power of the Glasgow gas for the week ending on the 19th inst. shows what may be regarded as very good results. In no instance was the minimum under 25·90 candles, while in one district it was as high as 27·69 candles. The average ranged from 26·30 candles to 28·78 candles, and the maximum varied, over the four testing-stations, between 26·92 candles and 30·33 candles. The last-mentioned maximum has been very seldom reached during the last few months.

In connection with the consideration of Mr. J. F. King's usual report on the analysis of the gas supplied to the City of Edinburgh, presented to the Town Council on Tuesday last, a discussion of some interest arose. The analysis made on the 10th inst. showed the illuminating power of the Edinburgh Company's gas to be equal to 28·90 standard candles, and that of the Leith Company to be equal to 25·70 candles. Mr. Somerville proposed that the report be remitted to the Cleaning and Lighting Committee for consideration. Evidently, he said, the quality of the Leith gas was getting worse instead of better, and he had been told the gas for the street lamps was taken from both Companies. Bailie Colston said the city paid about £9000 a year to the Edinburgh Company, and £200 to the Leith Company, the latter not being for public lamps at all. Mr. M'Lachlan said that an analysis should be got of the gas supplied to other towns, so as to be able to institute a comparison with the Edinburgh gas, which was charged so dear; to which Bailie Rowatt replied that all this had been got before, and that Edinburgh was found to stand higher than any other city in Great Britain or Ireland. The average of all the other towns was 16 candles, while that of Edinburgh was 27 candles. The motion was agreed to.

I understand that a conference recently took place at Dumfries between Mr. B. M. M'Crae, of Dundee, and Mr. S. Stewart, of Greenock, the two gentlemen who have been commissioned to act as the arbitrators in the transference of the gas-works of that town to the Municipal Authorities, under Sir Windham Anstruther's Gas Act, the former for the Town Council, and the latter for the Gas Company. In the event of any difficulty arising between them in the course of the arbitration, they have mutually chosen Mr. Alexander Smith, Corporation Gas-Works, Aberdeen, as the umpire or oversman.

At the last meeting of the Police Commissioners of Glasgow it was stated that a report had been submitted to the Watching and Lighting Committee, by the Inspector of Lighting, in reference to an application from the lamplighters for, an increase of wages. The report recommended an additional grade of lamplighters, with increased pay, on the ground that during the year there had been a considerable increase of work, owing to the substitution of swallow-tail burners for single jets. The rates of wages recommended for the two grades of lamplighters were 20s. and 22s. per week, and were arrived at from a comparison of the rates paid in Belfast, Birmingham, Bristol, Dublin, Manchester, Leeds, and Liverpool, with those hitherto paid in Glasgow.

On the evening of Friday week the burgh of Crosshill and part of Govanhill, both of which are in the southern suburbs of Glasgow, were suddenly thrown into total darkness by the extinction of the gas in the houses and in the streets. The places of business were about to close, and considerable inconvenience was experienced in consequence. For a time there was quite a flutter of excitement amongst the inhabitants, and a general stampede for candles was made upon the shopkeepers who were fortunate enough to have a stock on hand. It was stated that during the day some repairs had been executed upon the governor for the district, and that the accident arose from it, as there was an ample supply of gas at the time, in the gasholders at the Tradeston works from which the district is supplied. After the lapse of about three-quarters of an hour matters were put to rights, and the gas again lighted.

The Glasgow pig iron market has shown a rather hardening tendency during the past week, and a good business was done. At the close on Friday afternoon as high as 50s. 11d. to 51s., cash, and 51s. 2d. to 51s. 2½d. were paid, with buyers remaining at the higher quotations. Coltness No. 3 has been advanced in price 6d. per ton.

No improvement can be reported regarding the coal market. Miners wages have been very generally reduced about 6d. per day during the last few weeks.

HULL GAS SUPPLY.—Mr. J. Baynes reports that the gas sent into the district of Sculcoates and Myton, by the British Gas Company, during December, 1877, gave the following results, sulphuretted hydrogen and free ammonia being at no time present to the ordinary tests:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16·40	14·97	15·70
Grains of sulphur per 100 feet	31·00	27·60	29·02
Grains of ammonia per 100 cubic feet	—	—	0·25

Mean barometer, 29·93; temperature 56°.

SEVENOAKS WATER-WORKS COMPANY.—At an extraordinary meeting of Proprietors on the 15th inst., it was resolved—"That instead of the remaining share capital of the Company, consisting of 69 shares of £20 each, being disposed of by the Directors by public auction, as provided by resolution of general meeting, held on July 17, 1877, the Directors be and they are hereby authorized to offer such shares, or a sufficient number of them, at par, to the registered Shareholders of the Company, at the date of such offer, in the following proportions, viz.:—To the holder of eight shares, one share, and to the holder of more than eight shares, one share for every eight shares held by him or her."

MARGATE WATER-WORKS COMPANY.—The Ordinary General Meeting was held on the 21st inst.—Alderman Pickering in the chair. The balance-sheet was very satisfactory, and a dividend of 5 per cent. for the half year was declared, making, with an interim dividend of 5 per cent., the maximum dividend of 10 per cent. for the year. It was stated that efforts are being made, by the completion of a new pumping-station in the Dane, to secure an ample supply of good water to meet the increasing demand of the town, which has become considerably enlarged of late years; and the Chairman

said that, as it would be necessary to borrow money for the extension of the plant, it was in contemplation to apply to Parliament for a Provisional Order to raise the capital required.

PAISLEY GAS-WORKS EMPLOYÉS SOIRÉE.—The first *soirée* of the *employés* of the Corporation Gas-Works was held in the Abercorn Rooms last Thursday night. The large hall was quite filled. Provost Murray presided, and beside him on the platform were other members of the Town Council; Messrs. Young and Martin, Town Clerks; the Rev. Mr. France, &c. After tea, the Chairman, in a brief speech, referred to the relations that ought to exist between employers and employed, the necessity of steadiness on the part of gas workers, and the advantages of cultivating habits of prudence in the conduct of life. Other speakers followed, and a large musical programme was also gone through, a very agreeable evening being spent.

GAS EXPLOSION AT EASTBOURNE.—On Tuesday last an explosion of gas occurred at 13, Victoria Place, Eastbourne. The house is at present unoccupied; but, with a view to air the rooms, it has been the custom to keep the gas alight in the house during the daytime. A person went to the house for the purpose of lighting the gas about noon. Soon after he had done so the neighbours were alarmed by a report, accompanied by the sound of broken glass. An examination of the premises showed that considerable damage had been done. The window of the dining-room was found to be blown out, and the door was forced off its hinges and thrown into the passage. The plate-glass of the drawing-room was hurled into the street; the kitchen window was dashed inwards, and glass broken in other parts of the house. Some paintings in the room were seriously damaged, and the ceilings of the lower rooms were more or less injured. The damage altogether is considerable; but the house, as well as the furniture, is insured.

BRADFORD CORPORATION WATER BILL.—A meeting of owners and occupiers of property in Pudsey was held on the 21st inst., at which it was resolved—"That consent be given to the Local Board, either alone or in combination with any other local authority or authorities, to oppose in Parliament a Bill proposed to be introduced during the next session by the Mayor, Aldermen, and Burgesses of the Borough of Bradford, for conferring upon them further powers in relation to their water-works, in order to obtain the introduction of clauses into such Bill, fixing the maximum prices for water to be supplied by the Corporation in this and other districts outside the Borough, within the Corporation's limits of water supply; and providing that the distribution of the water supply, and the price to be charged below the maximum, shall, in cases of difference, be settled by arbitration, under the Public Health Act, 1875; and for the purpose of such opposition to incur all necessary and proper expenses, which shall be payable out of the general district rate."

PARTICK, HILLHEAD, AND MARYHILL GAS-WORKS EMPLOYÉS SOIRÉE.—The sixth annual festival of the *employés* of this Company took place last Friday night, in the Burgh Hall, Hillhead. Provost Ferguson occupied the chair, and on the platform were the following gentlemen:—Provost Cowan, Rev. Mr. Shanks, of Maryhill, Messrs. Andrew Paton, George R. Alexander, Paterson Wingate, John Wilson, W. Macleod, T. O. Niven, A. C. Wilson, James Hislop, Wm. Graham, &c. The Chairman, in the course of an interesting address, referred to the continued prosperity of the Company and the quality of the gas, which, he said, was second to none. The Company were established in 1872, and during that year 67 million cubic feet of gas were manufactured. Although they had to contend against a good many difficulties at the outset, yet by perseverance, good management, and producing a good article, they had been able to surmount all obstacles. The consumption at present was 120 million cubic feet annually, which was a very rapid increase. He was also very glad to learn that the *employés* all worked harmoniously together. The programme for the evening was a very inviting one, embracing songs, humorous readings, &c., and a double "service of fruit." The musical part of the programme was sustained by Miss F. Wright, Mrs. Rushbury, Mr. Hamilton, and Mr. West.

REDUCTION IN THE CONSUMPTION OF WATER AT GLASGOW.—At the meeting of the Water Committee of the Glasgow Corporation on the 21st inst., the minute of the sub-committee on district meters was presented. It contained a tabular report by Mr. Gale, showing the results of the system of inspection from the commencement in April, 1876, to Dec. 11, 1877. Five districts were thus dealt with, all in the west and north-west parts of the city, and the following is an abstract of the results:—

Number of District.	Number of Occupants at Night.	Gallons per Head per Day.			
		At Starting of Meter.		Latest Results.	
		Total.	Night Rate per 24 Hours.	Total.	Night Rate per 24 Hours.
District No. I. . . .	15,380	59·2	45·0	38·9	17·4
Do. II. . . .	10,424	65·8	60·2	36·4	24·9
Do. III. . . .	5,014	61·4	52·0	33·8	15·1
Do. IV. . . .	7,846	65·8	47·5	38·8	21·0
Do. V. (Part of)	5,682	42·7	27·5	26·7	12·2
Total and averages . .	44,346		47·5		18·9

Average consumption per head at night, at starting of meter . . . . . 47·5 gallons per 24 hours.
Ditto, at Dec. 22, 1877 . . . . . 18·9 ditto.

Saving . . . . . 28·6 gallons per 24 hours.
Total population at night, 44,346 × 28·6 = 1,268,300 gallons.

SUFFOCATION BY GAS AT DUNDEE.—Considerable sensation was created in Foundry Lane and neighbourhood in the east end of Dundee, on Monday, the 21st inst., when it became known that two persons, a mother and her daughter, had been suffocated by gas. The victims, Mrs. Thomas Fields and her daughter, Eliza, lived together in a two-roomed house in Foundry Lane, and both earned a livelihood as mill workers. They were last seen on the previous Saturday. On that night and on Sunday a strong smell of gas was felt in the tenement by the neighbours, but nothing serious was apprehended. On Monday evening, however, as the smell still continued, an inspection of the premises was made, and as the deceased persons had not been seen at meal hours as usual, and the key of the door was found in the lock inside, the suspicion was aroused that something was seriously wrong. Mr. M'Crae, the Manager of the Gas-Works, was sent for, and he, and a plumber who resides in the house above that in which the deceased resided, burst open the door. The house at this time was quite dark, and was so full of gas that they could not venture to enter for a considerable time. They then procured a lamp, and on entering the house were horror-struck to find Mrs. Fields and her daughter lying in bed quite cold and dead, having evidently been suffocated by gas. No gas-meter was in the house, and a paraffin lamp had been used to give light. Below the sink the end of the inlet gas-pipe had been fractured by some utensils having been placed against it, and from this fracture the gas was found escaping very largely. It is believed that the deceased had both been suffocated on the Saturday night, or early on Sunday morning.—*Glasgow Herald.*

HULL WATER SUPPLY.—Mr. Maxwell, the Engineer of the Hull Corporation Water-Works, has submitted to the Committee having charge of this department schemes for new water-works, at a cost of over £40,000. He says that 20 years hence Hull will in all probability require 10½ million gallons per day, or 5 millions more than at present. Estimating the full power of Springhead at 6 million gallons per day, the Corporation must provide 4½ millions, or 75 per cent., more water. With a view to this further supply he suggests three schemes. The first refers to the "Dam Springs," which are situated three miles north of Springhead, and when the watercourse was gauged last July it was found flowing at the rate of 3 million gallons per day, which could be supplemented, if necessary, in dry seasons. The scheme he estimates would cost £41,000. The second site suggested is in the vicinity of Keldgate, about two and a quarter miles north-west of Springhead. The water from the springs here was found running at the rate of 8 million gallons per day in February last year. An additional advantage over the first-mentioned scheme is that this possesses fields at such elevations as to be suitable for reservoirs. Total cost £42,500. The third project mooted is an extension of the present Springhead Works. For this purpose he suggests that from the new (Woodhouse) shaft, at about 65 feet below the surface, they should strike an adit about a mile long, rising 12 feet. The adit would be left unlined, with a chalk surface of 66,000 square feet, and, intercepting numerous fissures in the rock, would doubtless of itself bring down to the shaft a large additional quantity of water. But, besides this, one bore could be sunk at half a mile distance from Springhead, another at three-quarters, and a third at the extremity of the adit. From each bore he expected a million gallons daily additional, which would bring the total supply up to 10 millions. Total cost, £31,500. The engineer has now been requested to report as to the quantity of water supplied for manufacturing and sanitary purposes, and whether Stoneferry could not be utilized for such purposes, and the cost of adopting the same.

LIGHTING BY ELECTRICITY.—Dr. C.W. Siemens delivered an address before the Society of Telegraphic Engineers, on Wednesday evening last, on the progress of electric telegraphy. In the course of it he made the following remarks in reference to lighting by electricity:—"Much has been said about the application of electricity for producing light, and the French Alliance Company, as well as the Gramme Company, have, it is known, for some years been establishing magneto-electric apparatus to illuminate the lighthouses upon the French coast and for galvanoplastic purposes. By an ingenious combination of two magneto-electric machines, with Siemens armatures, Mr. Wilde, of Manchester, succeeded in greatly augmenting the effects produced by purely mechanical means; but the greatest impulse in this direction was given in 1866-67 by the introduction of the dynamo-electrical principle, which enables us to accumulate the current active in the electric circuit to the utmost extent permissible, by the conductive capacity of the wire employed. Dr. Tyndall and Mr. Douglass, Chief Engineer to the Trinity Board, in reporting lately to the Elder Brethren upon the power of these machines and their applicability to lighthouses, give a table showing that a machine weighing not more than 3 cwt. is capable of producing a light equal to 1250-candle power, per horse power expenditure of mechanical energy. Assuming that each horse power is maintained with an expenditure of 3 lbs. of coal per hour (which is an excessive estimate) it would appear that one pound of coal suffices to maintain a light equal to 417½ normal candles for one hour. The same amount of light would be produced by 139 cubic feet of gas of 18-candle power, for the production of which 30 lbs. of coals is consumed. Assuming that of this quantity, after heating the retorts, &c., 50 per cent. is returned in the form of gas coke, there remains a net expenditure of 15 lbs. of coal, in the case of gas lighting, to produce the effect of 1 lb. of fuel expended in electric lighting, or a ratio of 15 to 1 in favour of the latter. Add to the advantages of cheapness in maintenance, and of a reduced capital expenditure, in favour of the electric light, those of its great superiority in quality and its freedom from the deleterious effects of gas in heating and polluting the atmosphere in which it burns, and it seems not improbable that it will before long supersede its competitor in many of its applications. For lighthouses, for military purposes, and for the illumination of large works and public buildings, the electric light has already made steady progress, while for domestic applications the electric candle proposed by Jablochkoff, or modifications of the same, are likely to solve the difficulty of moderating and distributing the intense light produced by the ordinary electric lamp. The complete realization of all the advantages of the electric light remains, however, a problem to be solved, and it would be extravagant to expect, from applications on a small scale such as have hitherto been made, anything like the amount of relative advantage indicated by theory."

LUMINOSITY OF BENZOL WHEN BURNT WITH NON-LUMINOUS COMBUSTIBLE GASES.—Professor Frankland and Mr. L. T. Thorne presented a paper on this subject at the meeting of the Chemical Society on Thursday, the 17th inst. It was pointed out by Professor Frankland, in 1852, that hydrogen, carbonic oxide, and marsh gas practically contribute nothing to the luminosity of coal gas, and that the only constituents of value were benzol, ethylene, propylene, butylene, and acetylene. The authors have endeavoured to determine the luminosity of benzol individually, and propose in future papers to make similar experiments on the other illuminating constituents of coal gas. Many attempts were made to burn benzol with a smokeless flame, and several lamps were constructed by Mr. Silber, but all the experiments yielded unsatisfactory results, and the authors had to limit their experiments to the determination of the luminosity of benzol vapour after dilution with hydrogen, carbonic oxide, and marsh gas. These three gases were separately prepared in the usual way, and were passed through a brass cylinder, 6½ inches long and 3 inches internal diameter, packed with sponge saturated with pure benzol, the whole being kept at a constant temperature by immersion in water. The quantity of benzol in the gas was determined by absorption with sulphuric acid. The authors obtained the following numbers:—One cubic foot of benzol vapour burnt in a fish tail burner with hydrogen gave, for one hour, the light of 69·71 candles; one ditto, carbonic oxide, 73·38; one ditto, marsh gas (1st series), 92·45; one ditto, marsh gas (2nd series), 93·94 candles, at the standard pressure and temperature. Hence 1 lb. avoirdupois of benzol gives, when burnt with hydrogen, the light yielded by 5·793 lbs. of spermaceti; with carbonic oxide, 6·100 lbs.; with marsh gas (1st series), 7·682 lbs.; with marsh gas (2nd series), 7·803 lbs. spermaceti; or, in other words, a given weight of benzol produces 5·3 per cent. more light when it is diluted with carbonic oxide, and between 32·6-34·7 per cent. more light when diluted with marsh gas, than when diffused in hydrogen. The authors point out that this difference is probably due, at all events in part, to the different pyrometric thermal effects of the gaseous mixtures. In reply to the Chairman (Professor Odling), Dr. Frankland stated that this increase in the illuminating power of benzol when mixed with marsh gas was not opposed to his former statement, that marsh gas did not contribute materially to the illuminating power of coal gas, because in coal gas the principal hydro-

carbons were ethylene and members of that series, which would not raise the temperature to any considerable extent when burnt with marsh gas, as compared with the effect produced by benzol vapour and marsh gas.

PROPOSED PURCHASE OF THE STOKE GAS-WORKS.—A meeting of ratepayers of the Local Board district of Fenton was held on the 22nd inst.—Mr. Malkin in the chair—to consider the question of the proposed purchase of the Stoke Gas-Works. In opening the proceedings, the Chairman said that some time ago the ratepayers approved of the purchase, together with Stoke, of the Gas Company's interest. All that now remained was that such approval should be confirmed, as the former meeting was called at a three days notice, and was consequently informal, because the Act of Parliament required a ten days notice. Upon the faith of the decision of the former meeting, the Local Board had gone on to the preliminaries of the purchase, in conjunction with the Stoke Corporation, and certain important expenses had been incurred. He would, therefore, propose—"That this meeting approves of the promotion of a Bill in Parliament in the ensuing session for the following, among other, purposes:—The acquiring, in conjunction with the Corporation of the borough of Stoke, of the gas-works and undertaking of the Stoke, Fenton, and Longton Gas Company, the conferring upon the Local Board and Corporation respectively all such powers as may be deemed necessary for carrying into effect the foregoing purchase, including the raising of the requisite funds therefor, and that the expenses of the Bill be charged to the general district rate account of the Board." Mr. Thomas Hassell seconded the motion. He recommended the scheme with confidence. In Fenton they had no sources of revenue beside the rates, and he thought that it was their duty to embrace an opportunity to lessen the rates. He had often wondered how the people in Leek got off with such small rates, but he had found out the secret—the Commissioners had for some time supplied the town with gas and water, and the profits were such as to reduce the rates considerably. In reply to a ratepayer, Mr. Hassell said that if Fenton were not to proceed with the purchase of the works, but to try and make her own gas, she would most certainly be opposed by Stoke. Indeed, there was not the remotest chance of the necessary power ever being granted. In reply to another ratepayer, the Chairman said that Fenton and Stoke would pay an equal amount of the purchase, and the profits would be divided according to the amount consumed in each district. He had no doubt but the consumption of gas in Fenton was as much as in Stoke. Longton Goods Station was in Fenton township, although it had not been reckoned so in the Company's receipts. After some explanations had been furnished by the Clerk, the motion was put and carried, with one dissentient.

Register of New Patents.

3485.—CLARK, A. M., Chancery Lane, London, "*Improvements in the purification of gas.*" Patent dated Sept. 4, 1876.

Illuminating gas obtained from coal still contains, after passing through the condensers, volatile ammoniacal salts, principally carbonate and hydrosulphate, as well as free hydrosulphuric and carbonic acids. In purifying with oxide of iron, the latter absorbs the hydrosulphuric acid, whether free or combined with ammonia, and the gas on leaving the purifiers contains carbonic acid and a certain quantity of ammonia, generally insufficient, however, for converting the whole of the carbonic acid into carbonate, and *à fortiori* into bicarbonate of ammonia. The free carbonic acid remaining in the gas passes, either wholly or in part, to the burners, and impairs the illuminating power of the gas.

This excess of carbonic acid is usually removed from the gas by means of lime; but this invention consists in an improved process for absorbing it, whereby the whole of the carbonic acid remaining in the gas after purification with oxide of iron is transformed into sesquicarbonate, or preferably into bicarbonate of ammonia, both of which are soluble in water. To this end the gas, after being freed from the hydrosulphuric acid, is brought into intimate contact with caustic ammonia, in quantity sufficient to convert the carbonic acid into sesquicarbonate, or preferably bicarbonate of ammonia. This ammonia may be either in a gaseous or liquid condition, and if in a gaseous form it may be introduced into a pipe in which gas at a higher pressure is circulating. If the ammonia be employed in a liquid state, it is introduced into a vessel or receiver, and the gas made to bubble through it. The ammonia may also be introduced in the gas in the form of spray. In both cases the gas is passed through a series of washers or scrubbers, water, or the liquids obtained from the preceding operations, being used so as to completely dissolve the carbonate formed.

The quantity of ammonia it is necessary to introduce into the gas, to effect the complete transformation of the carbonic acid, necessarily varies with the conditions of the distillation and condensation, and the kind of coal, &c.; it is, therefore, necessary from time to time to test the amount of carbonic acid and of ammonia contained in the gas, in order to ascertain the quantity of ammonia required. The bicarbonate thus formed may be obtained in the form of a more or less concentrated solution, or even in a solid form, or in crystals formed in the liquor.

The bicarbonate of ammonia thus obtained is suited for various uses in the arts, and in the manufacture of chemical products; but instead of collecting the bicarbonate of ammonia, it may, at the moment of its formation, be made to effect certain chemical reactions and preparations. For example, saline solutions as neutral as possible, chlorides, sulphates, or nitrates may be placed in the second and third of the series of wash vessels above referred to, whereupon there will be formed bicarbonates, if solutions of soda or potash have been employed; or carbonates, which, being soluble, or but slightly soluble, will be deposited; hydrochlorate, sulphate, or nitrate of ammonia remaining in the liquid. The bicarbonates or carbonates are separated and purified by known processes.

The supernatant liquid may, if necessary, be again passed through the washing apparatus. The carbonic acid contained in the gas may also be absorbed in another manner by placing, in the several washing apparatus, a solution of carbonate of soda or potash, bicarbonate being formed on the passage of the gas, and deposited. There may also be placed in the washing apparatus the saline solutions above indicated, after dissolving therein gaseous ammonia, or adding thereto a highly concentrated solution of ammonia.

The apparatus employed in the application of these processes varies according to the nature of the products to be obtained. If it is desired to obtain products in solution, such as bicarbonate or carbonate of ammonia, a series of washing vessels may be employed, through which the gas is caused to bubble, or it may be passed through columns, or scrubbers. If solid products are to be obtained, washing apparatus provided with agitators or scrapers should be employed, and in the latter case it would be of advantage to isolate one of the washers in order to more readily extract the precipitate formed. All the above apparatus is well known in gas-making.

Instead of employing caustic ammonia in the before described operations, ammonia water may be used, deprived of the hydrosulphuric acid it may contain, or the same water may be desulphuretted and concentrated by distillation. The carbonic acid contained in the gas may also be freed by the action of ammonia after condensation. The ammonia in this case combines not only with the carbonic acid, but also with the free hydrosulphuric acid, although after a certain time the carbonic acid partially decomposes the hydrosulphate formed, and hydrosulphuric acid is again set free. It would, therefore, on account of this reaction, be difficult, if not impossible, to completely purify the gas by washing with water after the intervention of ammonia. This result is better obtained by passing the gas through neutral metallic solutions, and then through at least one oxide of iron purifier, in order to ensure a thorough purification.

The gas may also after condensation be passed through neutral metallic solutions, and after the absorption of the ammoniacal compounds it contains there may be added, by one of the methods before indicated, caustic ammonia in sufficient quantity to transform the free hydrosulphuric and carbonic acids into hydrosulphate or carbonate or bicarbonate of ammonia, which may be afterwards eliminated from the gas by washing.

The above processes are applicable to coal gas and gases obtained from other matters, and containing free carbonic acid. The gas obtained from wood would come under this category, but as it contains considerable quantities of pyroligneous acid, it is necessary that the latter be completely absorbed before the intervention of the ammonia.

3493.—GIDNEY, J. W., West Ham, "*Improvements in apparatus for carburetting air or gas for illuminating or heating purposes.*" Patent dated Sept. 5, 1876.

This invention relates to apparatus for carburetting air or gas, in which such air or gas is passed through or over hydrocarbon spirit, or through or amongst cotton, wool, or other fibrous material impregnated with such spirit; and has for its principal object the production of greater regularity of action and uniformity of flame than can be obtained in the apparatus now in use, in which the arrangements are such that the more volatile portions of the spirit are first absorbed, producing a light of high illuminating power, and then the less volatile portions, producing a light decreasing in intensity in proportion to the reduced volatility of the spirit being absorbed.

The invention consists, firstly, in arrangements and adaptations of apparatus, whereby not more than a certain pre-arranged quantity of spirit can be present in the carburetting chamber, and the supply of spirit thereto is kept up automatically in proportion as it is absorbed by the air or gas, whereby the spirit is used up as supplied to the carburetting chamber, and the flame remains of uniform intensity at all times when the apparatus is in action. In order to effect this a cistern or reservoir is employed for the spirit, so connected, by tubes or otherwise, with the carburetting chamber, as to form with it what is generally known as a bird fountain arrangement. According to one modification it is proposed to employ, between the reservoir and the carburetter, a valve, which is held open by suitable mechanical means, to allow of the spirit flowing as required from the reservoir to the carburetter. When it is required to refill the reservoir with spirit, the valve is closed automatically, whereby the overflow of spirit from the reservoir into the carburetter, at the time of filling the latter, is prevented, without the necessity of inverting the apparatus in order to effect the filling, which would be necessary without such an arrangement. The flow of spirit through the valve is regulated by a pipe or passage, the lower end of which dips into, or is sealed by, the spirit in the carburetter, the upper end opening into the upper part of the spirit reservoir. As the spirit is evaporated in the carburetter, the lower end of the pipe becomes unsealed, and air or gas passes from the carburetter up the pipe into the reservoir, allowing spirit to flow from the reservoir through the valve into the carburetter, until the lower end of the pipe or passage is again sealed and the further supply from the reservoir prevented. A tap or valve is adapted to allow the air in the reservoir to escape during the process of filling or refilling the reservoir, and it is sometimes preferred to arrange the mechanism for operating the tap or valve, and the valve connecting the reservoir with the carburetter, in such manner that the valve cannot be opened without first closing the tap, whereby undue overflowing of the contents of the reservoir into the carburetter is prevented.

Secondly, in an improved arrangement of governor or regulator for regulating and equalizing the pressure of the air or gas entering the apparatus, or of the carburetted air or gas leaving the same. For this purpose, in connection with the air inlet or gas outlet, a valve is employed, governed by a float resting on the surface of the liquid, and preferably this arrangement is used in connection with a collapsible governor chamber adapted with adjustable weights or springs, whereby the pressure can be regulated as required.

3500.—RITTER, F. W., Birmingham, "*Improvements in cocks or taps.*" Patent dated Sept. 6, 1876.

The object of this invention is to produce taps with smooth channels throughout, to prevent the corrosion thereof and damage to the liquids passing through such channels, by coating or lining the channels, and protecting the plugs of the taps with tin or other non-corrosive metal.

3504.—FITZMAURICE, A., Carlow, "*Improvements in pumps.*" Provisional protection only obtained. Dated Sept. 6, 1876.

This invention consists in an improved arrangement of double-action lever force-pump, and method of working the same by the weight of a man or other person sitting on one end of a weighted rocking lever.

The under side of the rocking lever is connected by means of suitable connecting-rods with the piston-rods of a pair of single-action lift and force pumps, having proper air vessels and rising main-pipes for delivering the water in the required direction. The suction-pipes from the pumps are connected together into the single suction-pipe which passes into the well or tank from which the water is to be raised.

3510.—ANDERSON, R. C., Wood Green, "*Improvements in valves.*" Patent dated Sept. 6, 1876.

The object of this invention is to reduce, at will, to any desired extent, the pressure of water, steam, air, or gases in pipes, or other conduits, while maintaining, at that reduced pressure, a constant flow of the liquid or fluid in the pipes. This object is effected by means of weights applied in such a manner that the amount by which the pressure is reduced is directly proportional to the weight applied, and so long as that particular weight is left undisturbed, the pressure will remain unaltered, irrespective of variations, either in the pressure of the supply, or in the quantity of liquid or fluid drawn off, and should the discharge at any time be reduced to *nil*, the valve will be closed entirely, and thus prevent any increase in the reduced pressure.

In carrying out this invention, an air-tight piston is fitted into the upper portion of a vertical tube, which is open at both ends, and the piston is connected by means of a rod with a valve of the same area in cross section, by which the lower end of the tube may be closed. This rod projects a short distance above the piston, and terminates in a flat disc, fixed horizontally, for the purpose of supporting weights.

The inlet-pipe is connected with the vertical tube at a point about midway between the piston and valve, so that whatever pressure is conveyed by the inlet, it is communicated equally to piston and valve, and the two forces being in opposite directions, and equal to one another—the area of piston and valve being identical—the valve is always maintained in a state of equilibrium, no matter how great or how small the pressure conveyed by the inlet.

The lower end of the vertical tube is inserted into an air-tight chamber from which the outlet proceeds, and in such manner as to allow of the valve opening to its fullest extent without coming in contact with the bottom or sides of the chamber. Now, if the equilibrium be destroyed by placing weights upon the disc at the upper end of the piston-rod, the piston and valve will descend together, the liquid or fluid will flow through the valve opening into the chamber, and this opening will continue to increase in area as the valve descends, until the pressure, which will gradually accumulate in the chamber, exerts an upward force on the valve equal to the downward force exerted by the weight on the disc, when equilibrium will again be restored. Should the outlet opening be now increased, the pressure in the chamber will be diminished, and the upward force against the valve being less than the downward force of the weight on the disc, the valve will descend until its area of opening is large enough to restore the former pressure, when there is again equilibrium. Should the outlet be now closed entirely, the pressure in the chamber will increase, and the upward force against the valve being greater than the downward force of the weight on the disc, the valve will be forced upwards until it is closed entirely; for so long as the valve is open, be it ever so little, the fluid which escapes will exert an upward pressure until it closes the valve. The pressure in the chamber, which is always the same as that of the outlet, is thus regulated at pleasure by the number of the weights placed upon the disc; thus if the area of the valve be 1 square inch, and it be desired to maintain a pressure, at the outlet, of 40 lbs. on the square inch, the weight which must be placed upon the disc to produce this pressure will be 40 lbs.

A valve, constructed as above described, may be adapted for use with steam, water, air, or gas, the principle of construction remaining the same, though the details will depend upon the object for which it is desired to use the valve.

3528.—Robinson, C. S., Leicester, "*Improvements in burners for burning a mixture of gas and atmospheric air.*" Patent dated Sept. 8, 1876.

This invention has for its object the construction of Bunsen or atmospheric air and gas burners in such a manner, that the quantity of atmospheric air admitted to the burner shall be better proportioned to the quantity of gas consumed than is usually the case, and that the emission of gas and admission of air shall be effected at one operation by the partial turning of the handle of the gas-cock, which is so arranged as to serve as an air-valve as well.

The invention consists in forming a chamber, in which is fixed the barrel of a gas-cock, the connection extending to it below the chamber, so as to allow of it being screwed on to any ordinary gas-fitting. Into the top of the barrel of the cock is screwed a gas-burner, which extends a little above the chamber, and this burner is enclosed in a tube open at the top, and some 4 or 5 inches (more or less) in length. In the front of the chamber three holes are cut, through the centre one of which the plug of the cock passes into the barrel. Between the handle and the plug is fixed a disc, which, when the gas is entirely shut off, closes the air way to the chamber; but, as the disc is furnished with two holes, the partial turning of the handle will cause the holes in the disc to gradually correspond with the holes in the chamber, and thus admit the free passage of air. It will be seen that by properly arranging these holes the amount of gas emitted and the quantity of air admitted into the combustion-tube may be very nicely proportioned by the one operation of turning a single handle.

A modification of the foregoing consists in placing the gas-cock below the chamber, and attaching to the plug a disc which, on the handle being partially turned, either opens or closes a hole in the chamber.

Another modification consists in making the upper part of the plug nearly as large in diameter as the chamber in which it works, the chamber having a slot in it, through which the handle to the plug passes. An indent is cut in the plug corresponding to the slot, so that when the handle is partially turned, the opening or free way for air into the chamber is opened or closed in proportion to the gas emitted from the burner.

A further modification consists in dispensing with the chamber, as before described, by lengthening the combustion-tube below the gas-burner sufficiently to permit of slots being cut in the said tube, one to allow of the passage of the handle, and the other two for the admission of air. In this case the combustion-tube has an inner sleeve attached to the plug, and has two slots in it corresponding to those in the outer tube. Being fixed to the sleeve, the handle will, on being partially turned, produce the same effect as before described.

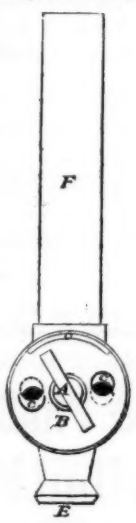

Fig. 1.

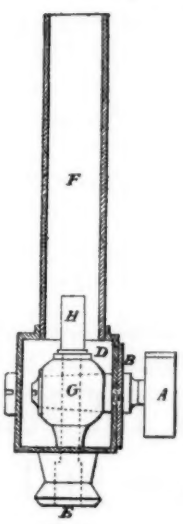

Fig. 2.

Fig. 1 is a front elevation of the arrangement of the burner first described, A being the handle of the cock, and B the disc having air-holes, C, C, which correspond with holes of the same size in front of the chamber, D; E is the inlet for gas; and F, the combustion-tube.

Fig. 2 is a side elevation, the chamber, D, and combustion-tube, F, being in section, for the purpose of showing the internal arrangement. The gas enters at E, and passes through the cock, G to the burner, H; at the same time air enters through the holes, C, in the disc, B, and through the holes, I, in the front of the chamber, D. It will be seen that on turning the handle, A, the gas and air ways are opened or closed at the same time in equal proportions. [Other modifications are shown in the drawings attached to the specification.]

The construction of Bunsen or atmospheric air and gas burners so that the turning of a handle opens or closes both the gas and air ways at the same time is not new, but the arrangement of the various parts, as described and shown on the drawings, whereby greater convenience is secured, is new.

3547.—Webber, C. E., Knightsbridge, "*Improvements in the manufacture of, and mode of utilizing, gas for heating or other purposes, and in the apparatus or means employed therein.*" Patent dated Sept. 9, 1876.

This invention relates more particularly to improvements on the invention for which letters patent were granted to Joshua Kidd, Feb. 13, 1875 (No. 531), and has for its object the improving the heating quality of the gas, and rendering the apparatus employed for generating and utilizing such gas more efficient in its action.

According to this invention, the tall, narrow, cylindrical feeder described in the specification of Kidd's patent is replaced by a shorter feeder of larger diameter, such feeder terminating below in an inverted truncated hollow cone, which may or may not project into the body of the gas generator itself. Into the lower or smaller part of this hollow cone is fitted a solid valve-plug, consisting of two cones placed base to base, the lower cone being shorter and more obtuse than the upper one. This valve is opened and closed by a rod or handle projecting above the cover of the feeder; upon the feeder there is fitted a hopper for charging the same with fuel, a sliding door being provided in the lower portion of the hopper, on a level with the cover of the feeder.

The use of the sheet-iron cylinder or frustum of a cone inside the furnace is dispensed with, and the gas outlet, which is capable of being more or less contracted at will, is placed either at the top or side of the furnace, as found most convenient. The fire-grate is contracted considerably, by sloping inwards the sides of the furnace at the lower part, whereby the action on the fuel of the mixture of steam and air is centralized. The capacity of the closed ash-pit, or mixing chamber, is increased by substituting for the moveable door heretofore proposed a cylindrical ash-pan, forming a close cap or cover to the mouth of the ash-pit, and capable of ready attachment and removal by the aid of a bayonet or similar joint. By the use of this ash-pan a more convenient receptacle for any ashes that may fall from between the grate-bars is not only obtained, but by increasing the capacity of the mixing chamber, a more complete admixture of the air and steam in such chamber, before entering the furnace, is secured. The water is supplied to the coil of pipe inside the gas generator from a water accumulator, in which a pressure of from 30 lbs. to 60 lbs. per square inch is maintained by the aid of a force pump or pumps.

It is further proposed to combine two of these gas generators, and to work them alternately with steam and air, and with steam alone. For this purpose the coils of both the generators are connected with the same water accumulator, and so soon as steam has been generated, and the fuel in one of the generators is found to be in an incandescent state, the steam jet is turned off for a moment, and so plugs up or temporarily closes the short air induction-pipe as to prevent the admission of air along with the steam jet into the ash-box, after which the steam jet is turned on again, by which method of working, gas of much higher heating power is obtained, consisting mainly of hydrogen and carbonic oxide with a small proportion of carbonic acid and other gases. If desired, this gas may be collected separately, or it may be conveyed into the same pipe or gasholder as the gas which is simultaneously produced by the second generator, thus improving the quality of the gas by decreasing relatively the proportion of nitrogen contained in it. It will be found that, by this mode of working, the intensity of the fire will be rapidly lowered, and, therefore, when this reaches such a point as to be no longer capable of readily decomposing the steam passed into it, the steam jet should be turned off, the air induction-pipe opened to admit air as well as steam, and the fire be then supplied with air and steam together, as heretofore proposed. The second generator in the meantime is operating with its air induction-pipe closed, so as to prevent the admission of air thereto, and is supplied with steam alone, as above described, and so on alternately, each generator being supplied in turn with steam and air and with steam alone.

In utilizing the gas produced, it is proposed to consume or burn it at the end of a contracted pipe, or through jets under the pressure obtained in the generation of such gas, or derived from an ordinary gasholder, or other well-known means. The gas may be consumed in its heated state as it issues from the generator, or it may be first cooled by passing through a series of pipes, or other convenient or well-known cooling arrangement. The proportion of air necessary for combustion should be capable of adjustment or regulation, and be induced by the pressure of the gas acting in a burner specially devised to ensure complete admixture of the gas and air previous to combustion. This peculiar burner consists of a cylindrical or other shaped chamber, open at the lower end, and surrounding and enclosing the gas-jet nozzle. A pipe of smaller diameter, but larger than the gas-jet nozzle, and constituting the actual burner, is fitted into the centre of the closed top of the said chamber, in a line with, but some distance above, the mouth of the gas-jet nozzle. This pipe may have a contracted opening.

By reason of the large dimensions of the chamber as compared with the diameter of the burner, the gas and air will be more intimately mixed in the said chamber before issuing through the contracted burner, at the top of which, whether contracted or otherwise, outside the chamber, the said mixture burns with intense heat, and by reason of the due proportion between the diameters of the gas nozzle of the burner the quantity of air necessary for due combustion will reach the gas.

APPLICATIONS FOR LETTERS PATENT.

233.—Thomas, H., Oldham, Lancs, "Improvements in gas-meters." Jan. 18, 1878.

240.—Hughes, E. T., Chancery Lane, London, "Improvements in electric lamps." A communication. (Complete specification.) Jan. 18, 1878.

244.—Livesey, J., Westminster, and Kidd, J., Wandsworth, London, "Improvements in the production of combustible gas, and in the enrichment thereof for illuminating purposes, and apparatus therefor." Jan. 18, 1878.

260.—Clark, A. M., Chancery Lane, London, "Improvements in wet gas-meters." A communication. Jan. 19, 1878.

286.—Cooke, J., Durham, "Improvements in the construction of rotary engines and pumps." Jan. 22, 1878.

290.—Pieper, C., Dresden and Berlin, "An improved gas motor." A communication. Jan. 22, 1878.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2842.—Wallace, R. W., and Claus, C. F., Southall, Middlesex, "An improved process for utilizing gas liquor in the manufacture of carbonate of potash and other salts, and sulphuric acid, and in apparatus therefor, which apparatus is also applicable for other like purposes." July 25, 1877.

4112.—Bray, G., Leeds, Yorks, "Improvements in gas-burners." Nov. 5, 1877.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS;
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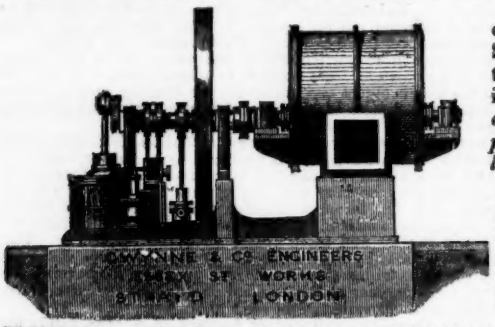

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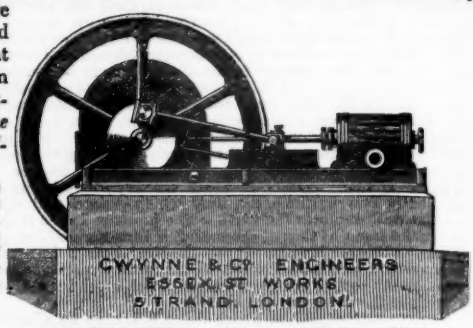

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WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.
John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

A Young Man, who has had several years experience in a Gas-Works, desires a SITUATION. Is well acquainted with the manufacture and distribution of gas, and has a thorough knowledge of chemistry. Excellent testimonials.
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Apply to J. HALL, Gas-Works, St. Helen's, LANCS.

FOR SALE—A First-Class Station-METER, to pass 20,000 cubic feet per hour. May be seen at work. It is to be disposed of to make room for one of greater capacity.
Apply to E. GODDARD, Gas-Works, IPSWICH.

THE Salford Corporation are prepared to receive TENDERS for the erection, at their No. 2 Gas Station, Regent Road, of a TELESCOPIC GAS-HOLDER, about 151 feet diameter, with two lifts, each about 40 feet deep.
The plans and specification can be seen, and all necessary information obtained, on application to the Engineer, Mr. Samuel Hunter, Gas-Works, Lamb Lane, Salford.
Tenders, endorsed "Tender for Gasholder," must be delivered to me, on or before Feb. 12, 1878.
The Corporation do not bind themselves to accept the lowest or any tender.
By order,
CHRIS. MOORHOUSE, Town Clerk.

BOROUGH OF NEATH.

THE Gas Committee of the Town Council hereby invite TENDERS for the purchase of the whole of the surplus TAR and SULPHATE of AMMONIA to be produced and manufactured at their Works, situate at the Millands, adjacent to the Great Western Railway, Neath, for a period of One, Two, or Three years from the 1st of March, 1878.
Sealed tenders, quoting prices for delivery into buyers trucks, at the Gas-Works, to be sent to Town Clerk's Office, Neath, not later than the 27th of February next.
Further particulars (if required) may be obtained on application to the Manager, at the Works.
By order,
ALFRED CURTIS, Clerk to the Committee.
Neath, Jan. 19, 1878.

HINDLEY LOCAL BOARD'S GAS-WORKS.

THE Hindley Local Board are prepared to receive TENDERS for about 300 tons of 8-inch. and 9-inch. Cast-Iron GAS-PIPES.
Specifications, quantities, and forms of tender may be had on application to the undersigned.
Tenders, endorsed "Gas-Pipes," to be sent to R. Pennington, Jun., Esq., Chairman, Local Board Offices, Cross Street, Hindley, near Wigan, on or before Friday, Feb. 8, 1878.
The Local Board do not bind themselves to accept the lowest or any tender.
By order,
STEPHEN HOLT, Clerk to the Board.
Jan. 24, 1878.

REMOVAL.

CHARLES HEISCH, F.C.S., Analytical and Consulting Chemist, Superintending Gas Examiner to the Corporation of London, &c., &c., has REMOVED from 8, Savage Gardens, to 79, MARK LANE, where he may be consulted as usual.

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(WATER SECTION.)

The Editor will feel greatly obliged if Secretaries and Engineers would fill up, and return to him at once, the forms sent them, as the work is now going to press. If any have not received Forms, they will be forwarded immediately, on application to the Editor,

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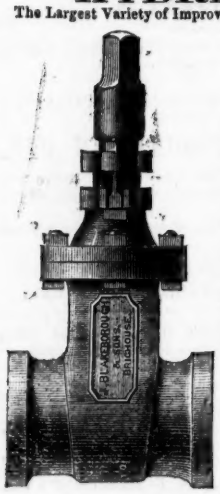

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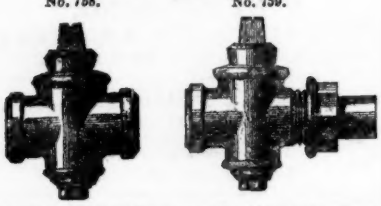

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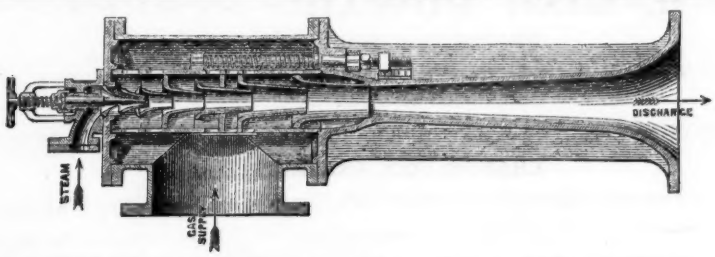

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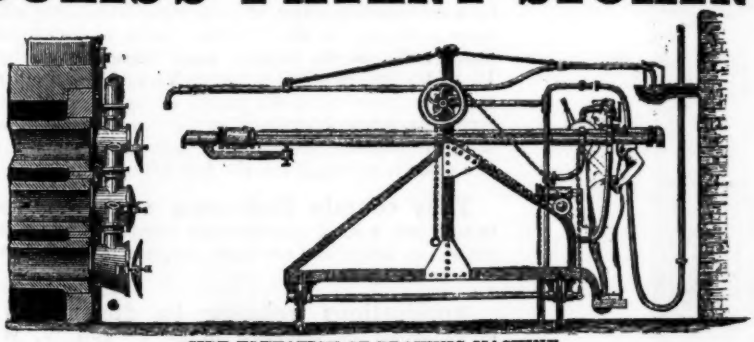

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Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

LESMAHAGOW CANNEL COAL.

FERRAND DAVIES,
148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,
SOLE AGENT FOR
THOMAS BARR'S LESMAHAGOW MAIN CANNEL.

Quotation and Analysis forwarded on application.

E. & W. H. HALEY,

General Ironfounders and Makers
OF
CAST-IRON GAS AND WATER PIPES.
Sizes 1¼ to 15 inches.

LISTER HILLS FOUNDRY, BRADFORD, YORKSHIRE.

GAS PURIFICATION.

BAILES & HALLSWORTH,
CONTRACTORS FOR THE
PURIFICATION OF COAL GAS
BY THEIR
PATENT HYDRATED PEROXIDE OF IRON MATERIAL.

The Material is adapted specially for taking up sulphuretted hydrogen, and will simultaneously absorb any ammonia that may pass the scrubbers.

The spent oxide resulting from our Material is more valuable than that from natural oxide of iron, and manufacturing chemists buy it in preference.

The Material has now been in use during the past three years in most of the principal Gas-Works in Yorkshire and elsewhere.

It contains considerably less moisture than natural oxide of iron, and is much cheaper and more efficient as a purifying agent.

B. & H. are purchasers of Spent Oxide, or will take Spent in exchange for New Material.

FOR SAMPLES AND TERMS, ADDRESS—
BAILES & HALLSWORTH, COPPERAS WORKS, ARMLEY. LEEDS.

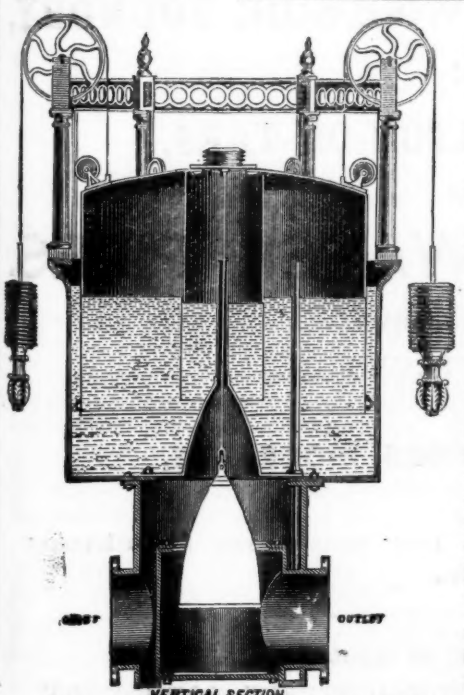
J. & J. BRADDOCK,

GLOBE METER-WORKS,
OLDHAM

Beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,
173, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.
Prices and full Analyses on application.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,
CANNEL COAL MERCHANT,
HAYMARKET, EDINBURGH.
Established 1840.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or export Best Wigan Arley Gas Coal and Nuts; best qualities of the Derbyshire, Yorkshire, and North Staffordshire Gas Coals and Nuts; also the best descriptions of Lancashire, Welsh, Scotch, and other Cannel.

Messrs. WILSON CARTER & PEARSON, being contractors to several of the principal Gas Companies in the Midland Counties, have pleasure in being enabled to give them as references.

Chief Offices: Temple Buildings, 50, New Street, Birmingham.

London Offices: 6, Great Winchester St. Buildings, E.C.

HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,524 cubic feet per ton of 14½-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9865 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

PRICES ON APPLICATION, EITHER F.O.B. OR BY RAIL IN TRUCK LOADS.

THE TYNE COAL COMPANY, LIMITED, OWNERS.
W. RICHARDSON, Fitter,
29, QUAYSIDE, NEWCASTLE-ON-TYNE.

ADDISON POTTER,

WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

GRIRDROD'S PATENT PORTABLE PIPE SCREWING MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,
Brassfounders, Gauge Injector and Tool Makers,
ALBION WORKS, SALFORD,
LANCASHIRE.

JOHN ABBOT & CO., LIMITED,

MANUFACTURERS OF

IMPROVED

HYDRAULIC CRANES & HOISTS,

Effecting an IMMENSE SAVING in the cost of discharging Coals from Vessels, Barges, &c.

HYDRAULIC RAMS FOR LIFTING AND LOWERING PURIFIER COVERS.

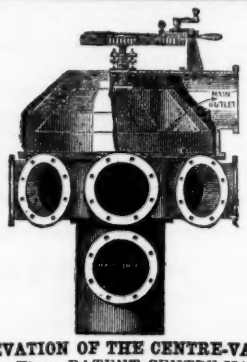
GAS PLANT GENERALLY, PIPES, ROOFING, TANKS, &c.,

PARK WORKS, GATESHEAD.

LONDON OFFICES: 2, SUFFOLK LANE, CANNON STREET, E.C.

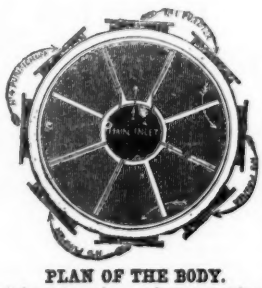
GLASGOW OFFICES: 54, ST. ENOCH'S SQUARE.

C. & W. WALKERS'
PATENT CENTRE-VALVES.



ELEVATION OF THE CENTRE-VALVE.

PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

THOMAS ALLAN & SONS,

IRONFOUNDERS,

WORKS:

SPRINGBANK FOUNDRY & NORTH WOODSIDE FOUNDRY,

GLASGOW;

BONLEA FOUNDRY, STOCKTON-ON-TEES,

Manufacturers of

CAST-IRON GAS AND WATER PIPES.

SIZES: ¾ to 12 inches at GLASGOW.

„ 1½ to 10 „ STOCKTON.

A LARGE STOCK KEPT, AND PRICES MODERATE.

Freight to London, in the Stream, 10s. per ton from Stockton; 15s. from Glasgow.

AGENTS FOR LONDON AND THE SOUTH OF ENGLAND:

THE THAMES BANK IRON COMPANY, UPPER GROUND STREET, LONDON, S.E.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON, Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

HYDRATED PURIFYING MATERIAL.

Samples on application.

MESSRS. SPENCE BROS., LIMITED,

Will be glad to supply the above on the most favourable terms.

PRICES ON APPLICATION.

ALSO PATENT DRY COPPERAS FOR EXTRACTING AMMONIA.

VICTORIA CHEMICAL WORKS, BRADFORD, NEAR MANCHESTER.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL: Back Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-made Retorts have now been in *actual work* nearly 1000 days, and are yet in good order. References on application.

July 2, 1877.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

"*Warrington Gaslight and Coke Company,*
Offices, Mersey Street, Warrington, April 23, 1877.

"MESSRS. NEWTON, CHAMBERS, AND CO.,

"GENTLEMEN,—After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

"The average of Nine samples gives a yield of **12,500** cubic feet of **15½**-Candle Gas, being equivalent to **664** lbs. of sperm per ton, and **1420** lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

"Yours truly, "JAMES PATERSON."

Full particulars will be sent on application to us—address as above.

NEW PATENT WET GAS-METER,

THE "RELIANCE,"

MANUFACTURED BY THE

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON.

TO DIRECTORS OF GAS COMPANIES, GAS ENGINEERS, AND MANAGERS OF GAS-WORKS.

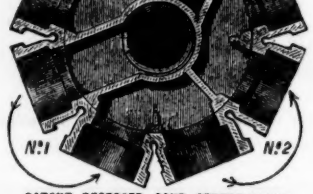
GENTLEMEN,—We beg to remind you that this is the time when all orders of any magnitude for Fire-Clay Gas-Retorts, and all kinds of Fire-Clay Goods likely to be required during next season, should be given out.

In reply to some scandalous reports that have been raised respecting our firm, we take this opportunity of saying that we have been established as the largest makers in the trade for over thirty years; that we are now in a better position than ever to supply our customers; and that, for quality of material, workmanship, and endurance, our goods are equal or superior to any produced. Soliciting your favours, we are, Gentlemen, your obedient Servants,

HARRIS AND PEARSON.

Illustrated Catalogues and Price Lists, or Special Quotation (on receipt of specification), sent free to any part of the World. Also quotations for Cast-Iron Pipes, Wrought-Iron and Lead Tubing. Manufacturers of all kinds of Sanitary Tubes and Blue Staffordshire Bricks of every description.

ADDRESS—HARRIS AND PEARSON, STOURBRIDGE.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Plan.

R. LAIDLAW AND SON,

EDINBURGH AND GLASGOW,

SOLE MAKERS OF

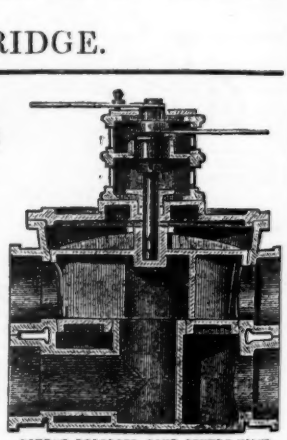
PATENT

RECESSED CONE CENTRE-VALVES,

Constructed on the principle of the ordinary Plug-Cock.

THROUGH-WAY & FOUR-WAY COCKS

Of all descriptions.



PATENT RECESSED CONE CENTRE-VALVE.
Sectional Elevation.

LONDON OFFICE: 106, CANNON STREET.

D. HULETT & CO.

Invite the attention of Gas Companies, Corporations, and others to their

PATENT STREET LAMPS,

Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.

PRICE 10s. each, net. Special quotations for large quantities.
Also made **EXTRA STOUT** recommended for its durability, PRICE 11s. 6d. each.

D. HULETT'S IMPROVED SERVICE CLEANSER,

By the use of which stoppages in service and other pipes are freed from naphthaline and other obstructions in a few minutes. PRICE 73s. net.

HULETT'S PATENT MERCURIAL REGULATOR,

For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

PATENTEES OF IMPROVED WET AND DRY GAS-METERS.

Makers of all kinds of Pressure-Gauges, Gaseliers, and every kind of Gas-Fittings for the Trade.

GAS HEATING AND COOKING STOVES.

55 and 56, HIGH HOLBORN, LONDON.

London: Printed by WILLIAM BOUGHTON KING (at the office of Clayton and Co. 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Jan. 29, 1878.